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THE MARINE FISHES OF PANAMA

BY

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AND

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PART II

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THE MARINE FISHES OF PANAMA.

BY SETH E. MEEK AND SAMUEL F. HILDEBRAND.

PART II.

Class III. Teleostomi—Continued.

Order XIV. Acanthopteri—Continued.

Family XLIV. Carangidæ.

THE CAVALLAS.

Body deep or elongate, usually more or less compressed; head compressed; occipital region usually with a keel; mouth of varying size; premaxillaries usually protractile; maxillary with or without a supplemental bone; preopercle usually entire in adult, armed with 3 or more spines in very young; teeth various, usually small, in one or a few series, or in villiform bands, on jaws, occasionally wholly wanting in adult; gills 4, a slit behind the last; gill-rakers long or short, few or many; pseudobranchiæ large, sometimes lost with age; branchiostegals commonly 7; scales small, cycloid, sometimes embedded, and occasionally obsolete; lateral line complete, usually with a prominent arch anteriorly, often wholly or in part armed with bony scutes; dorsal fins 2, separate, the spinous dorsal rather weak, usually preceded by a procumbent spine, the spines usually depressible in a groove; second dorsal long, usually more or less elevated anteriorly; anal fin similar to second dorsal in form, sometimes, however, much shorter, always preceded by 2 strong spines, more or less connected with the fin and with each other in young, separate in adult, sometimes, together with procumbent spine and one or two of the anterior spines of dorsal, disappearing with age; caudal fin widely forked; ventrals thoracic, I, 5; pectoral fins usually narrow; pyloric cæca generally numerous; vertebræ about 10+14=24. Most of the species of this family are widely distributed, and nearly all are valued as food.

KEY TO THE GENERA.

a. Lateral line wholly or in part armed with bony scutes. (Very weak and occasionally wanting in *Chloroscombrus*)

b. Dorsal and anal each with a single detached finlet. *Decapterus*, p. 333.

bb. Dorsal and anal without finlets.

c. Shoulder girdle with a deep furrow near its juncture with the isthmus, and a fleshy projection above it; eye large. *Selar*, p. 335.

cc. Shoulder girdle normal, not as above; eye of moderate size.

d. Lateral line armed with deep bony scutes for its entire length; last ray of second dorsal and anal enlarged, nearly separate in adult. *Trachurus*, p. 336.

dd. Lateral line with bony scutes on its straight portion only; last ray of second dorsal and anal not notably enlarged.

e. Maxillary very narrow; head small; teeth in jaws in a single close set series, few or none on vomer, palatines and tongue; dorsal and anal low, never with salient lobes, each with a conspicuous sheath of scales at base. *Hemicaranx*, p. 339.

ee. Maxillary broad; head rather large; teeth, if present, in one or more series, or in bands on jaws, never in a single close set series as above.

f. Teeth uneven, in one or a few series on jaws, persistent; villiform teeth usually present on vomer, palatines and tongue, these deciduous or wanting in some species. *Caranx*, p. 346.

ff. Teeth, if present, small and even, in a single series, or in villiform bands on jaws.

g. Minute teeth present on jaws and tongue, none on vomer and palatines, those on jaws lost with age. *Gnathanodon*, p. 360.

gg. Minute teeth on jaws, vomer, tongue, and usually on palatines, present at all ages.

h. The back much elevated; the dorsal outline more strongly curved than the ventral.

i. Snout well in advance of the forehead; anterior profile convex; anterior rays of second dorsal and anal filamentous.

j. Body more or less ovate in young, elongate in adult, not excessively compressed, the outlines not everywhere trenchant; scales of moderate size; dorsal and anal filaments of moderate length. *Citula*, p. 361.

jj. Body strongly ovate in young, somewhat elongate in adult, very strongly compressed, the outlines everywhere trenchant; scales

very small; dorsal and anal filaments long, extremely long in young. *Alectis*, p. 363.

ii. Snout scarcely in advance of forehead; anterior profile nearly vertical; soft dorsal and anal low, never falcate, the anterior rays not produced into filaments. *Vomer*, p. 365.

hh. The back little elevated; the ventral outline much more strongly curved than the dorsal; lateral line with few very weak bony scutes or none. *Chloroscombrus*, p. 369.

aa. Lateral line entirely unarmed.

k. Second dorsal and anal about equal in length, both longer than the abdomen.

l. Body deep, ovate; premaxillaries protractile; second dorsal and anal fins anteriorly elevated, falcate.

m. Body very closely compressed, the outlines everywhere trenchant; preorbital extremely deep; maxillary broad, with a well developed supplemental bone. *Selene*, p. 371.

mm. Body less closely compressed, the abdomen never trenchant; preorbital very narrow; maxillary narrow, without a distinct supplemental bone. *Trachinotus*, p. 377.

ll. Body oblong; premaxillaries not protractile, except in very young; maxillary narrow, without a supplemental bone; second dorsal and anal fins low, never falcate. *Oligoplites*, p. 387.

kk. Anal fin much shorter than second dorsal, its base shorter than abdomen.

n. Dorsal and anal each with a single detached finlet, composed of 2 rays. *Elagatis*, p. 393.

nn. Dorsal and anal without finlets.

o. First dorsal with 6 to 8 slender spines, connected by membrane at all ages; lateral line with a long, low arch, forming a slight keel on caudal peduncle in adult. *Seriola*, p. 394.

oo. First dorsal with 3 or 4 low, stiff spines, separate in adult, or connected by membrane in very young; lateral line scarcely arched, forming a prominent dermal keel on caudal peduncle. *Naucrates*, p. 399.

100. Genus **Decapterus** Bleeker.

Decapterus Bleeker, Nat. Tijds. Ned.—Ind., I, 1851, 358 (type *Caranx kurra* Cuvier & Valenciennes).

Eustomatodus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 261 (type *Decapterus kurroides* Bleeker).

Body elongate, fusiform; head rather short; snout pointed; mouth small; jaws subequal; maxillary broad, with a supplemental bone; premaxillaries protractile; teeth minute; scales moderate; straight portion of lateral line armed with bony scutes, at least posteriorly; first dorsal with slender, persistent spines; second dorsal and anal each with a single detached finlet; spines preceding anal well developed, persistent; pectorals rather short.

250. Decapterus punctatus (Agassiz).

Scomber hippos Mitchill, Trans. Lit. & Phil. Soc. N. Y., I, 1815, Pl. V, fig. 5 (not of Linnæus).

Caranx punctatus Agassiz, in Spix, Pisc. Brasil., 1831, 108, Pl. LVIa, fig. 2 (Brazil).

Caranx suareus Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 33 (Mediterranean).

Decapterus punctatus Poey, Syn. Pisc. Cub., 1868, 368; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 907.

Head 3.7 to 4.3; depth 4.3 to 5.3; D. VII or VIII-29 to 31-I; A. II-I, 25 to 27-I; lateral scutes 35 to 42.

Body elongate, little compressed, fusiform; the ventral outline anteriorly a little more convex than the dorsal; head rather short and low; snout pointed, 2.75 to 3.5 in head; eye 2.75 to 3.8; mouth small, oblique; jaws subequal; maxillary broad, reaching anterior margin of eye, 2.1 to 3.0 in head; teeth minute, those on upper jaw in a single series, those on lower jaw in a narrow band near symphysis, in a single series laterally; vomer, palatines, and tongue with bands of villiform teeth; gill-rakers short and close set, about 35 on lower limb of first arch; scales moderate; breast and most of head scaly; lateral line scarcely arched, the curved portion quite as long as straight part, the latter fully armed with deep, short scutes; first dorsal with very slender spines, the longest about as long as eye and snout; second dorsal and anal similar, little elevated anteriorly, each with a single detached finlet; caudal forked, the lobes short, subequal; ventrals rather small, about as long as postorbital part of head; pectorals shorter than head, never falcate, 4.4 to 5.7 in length of body.

Color bluish black above, silvery below; a distinct opercular spot present; dorsals and caudal dusky; other fins pale; axil of pectoral black.

We have a single specimen 147 mm. in length. The above description is based on this one and numerous specimens from the West Indies and the eastern coast of the United States. There

appears to be considerable variation among individual specimens of this species with respect to the shape of the body. In some specimens the body is almost perfectly fusiform, in others it is more or less compressed and usually notably deeper. That the tongue is devoid of teeth, as is stated in current descriptions, is not true of any of the specimens examined by us, for in each one the tongue has a narrow longitudinal band of minute teeth on its median line.

Known from Cape Cod to Brazil. Our specimen is from Porto Bello.

101. Genus **Selar** Bleeker.

Selar Bleeker, Nat. Tijds. Neder.—Ind., I, 1851, 359 (type *Caranx boops* Cuvier & Valenciennes).

Trachurops Gill, Proc. Ac. Nat. Sci. Phila., 1862, 238 (type *Scomber plumieri* Bloch=*Scomber crumenophthalmus* Bloch).

Body elongate, little compressed; the back not elevated; eye very large; shoulder girdle with a deep furrow at its juncture with the isthmus, and a fleshy projection above the furrow; other characters essentially as in *Caranx*.

251. **Selar crumenophthalmus** (Bloch).

Scomber crumenophthalmus Bloch, Naturg. Ausl. Fische, VII, 1793, 77, Pl. CCCXLIII (Acara [in Guinea]).

Scomber plumieri Bloch, Naturg. Ausl. Fische, VII, 1793, 79, Pl. CCCXLIV (Antilles).

Scomber balantiophthalmus Bloch & Schneider, Syst. Ichth., 1801, 29 (Guinea).

Caranx crumenophthalmus Lacépède, Hist. Nat. Poiss., IV, 1803, 703.

Caranx plumieri Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 65.

Trachurops brachychirus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 261 (Cape San Lucas).

Trachurops plumieri Poey, Enumeratio, 1875, 78.

Trachurops crumenophthalmus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1883, 196; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 75 (Panama Bay).

Head 3.03 to 3.35; depth 3.1 to 3.85; D. VIII-I, 23 to 26; A. II-I, 20 to 23.

Body elongate, little compressed; the back not elevated; ventral outline more strongly convex than the dorsal; head long and low; snout rather pointed, 3.3 to 3.9 in head; eye very large, with a well

developed adipose membrane in adult, 2.75 to 3.17 in head; mouth large, oblique; lower jaw projecting; maxillary reaching anterior margin of pupil, 2.1 to 2.45 in head; teeth small, present on both jaws, vomer, palatines and tongue, those in upper jaw anteriorly in two series, or a narrow villiform band in a single series laterally, those in lower jaw in a single series; vomerine teeth in rather broad patches; palatine teeth in a very narrow band or single series; tongue with a long, narrow villiform band; gill-rakers scarcely half as long as eye, 23 to 27 on lower limb of first arch; scales small, cycloid; breast fully scaled; head mostly covered with small scales; lateral line without an arch, armed with scutes which increase in size posteriorly; first dorsal with rather high, slender spines; second dorsal and anal similar, moderately elevated anteriorly, each with a low sheath of scales at base; caudal moderately forked, the lobes subequal, shorter than head; ventrals rather long, reaching to or slightly past vent; pectorals rather long and falcate, 3.2 to 4.5 in length of body.

Color bluish above, silvery below; snout and tip of lower jaw dusky; fins mostly dusky; dorsal and caudal edged with black.

Of this species 6 specimens, ranging from 93 to 255 mm. in length, were secured. Three of these are from the Atlantic coast and the other 3 from the Pacific.

Known from most tropical seas. Our specimens are from Porto Bello and Panama City market. The specimens from the two coasts seem to agree perfectly.

102. Genus **Trachurus** Rafinesque.

Trachurus Rafinesque, Caratteri, etc., 1810, 41 (type *Scomber trachurus* Linnæus=*Trachurus saurus* Rafinesque).

Body elongate, somewhat compressed; the back not elevated; head rather low; snout blunt; mouth moderate; premaxillaries protractile; maxillary of moderate width, supplemental bone present; teeth minute, mostly in a single series on jaws; vomer, palatines and tongue with bands of villiform teeth; gill-rakers long and slender, close set; lateral line prominently arched anteriorly, armed with bony scutes for its entire length, those on straight portion the strongest, spinous; an accessory dorsal branch to lateral line; first dorsal with rather slender spines connected by membrane; second dorsal and anal similar; no finlets, but the last ray of second dorsal and anal enlarged and nearly separate in adult.

KEY TO THE SPECIES.*

a. Body rather deep, compressed, its depth 3.45 to 4.25 in its length; curved portion of lateral line usually notably shorter than the straight part; bony scutes very deep, the deepest in straight part of lateral line about three-fourths the depth of eye; pectorals reaching to beginning of straight part of lateral line. *trachurus*, p. 337.

aa. Body very elongate, little compressed, its depth 4.5 to 5.3 in its length; curved portion of lateral line as long as the straight part; bony scutes narrow, the deepest in straight part of lateral line slightly more than half the depth of eye; pectorals failing to reach beginning of straight part of lateral line. *picturatus*, p. 338.

252. Trachurus trachurus (Linnæus).

Scomber trachurus Linnæus, Syst. Nat., Ed. X, 1758, 298 (Mediterranean Sea); Bloch, Ichtyol., II, 1785, 97, Pl. LVI.

?Caranxomorous plumierianus Lacèpéde, Hist. Nat. Poiss., III, 1802, 84, Pl. II, fig. 1 (from a figure by Plumier; Martinique?).

Caranx semispinous Nilsson, Prodr. Ichthyol. Scand., 1832, 84 (Scandinavia).

Caranx trachurus Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 11 (part).

Trachurus europæus Gronow, Cat. Fish, 1854, 125 (Seas of Europe).

Trachurus trachurus Gunther, Cat. Fish. Brit. Mus., II, 1860, 419 (part); Lutken, (Dan. Vid. Selsk. Skr., 5 ser., XII) Spolia Atlantica, 1880, 125; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 910, Pl. CXL, fig. 384.

Trachurus declivis Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 358 (not *Caranx declivis* Jenyns).

Head 3.25 to 3.75; depth 3.45 to 4.25; D. VII or VIII-I, 30 to 35; A. II-I, 24 to 27.

Body of moderate depth, compressed; the back little elevated; dorsal and ventral outlines about evenly convex; head rather long, compressed; snout blunt, 13.2 to 4 in head; eye 3.25 to 4.38; mouth moderate, oblique; lower jaw projecting; maxillary reaching slightly past anterior margin of eye, rarely to anterior margin of pupil, 2.4 to 2.88 in head; teeth weak, in a single series on jaws; vomer, palatines and tongue with bands of villiform teeth; gill-rakers long and slender.

*For a revision of this genus see Nichols (Bull. Amer. Mus. Nat. Hist., XLII, 1920, 477 to 481), whose classification, with the limited material available, we are unable to verify.

about two-thirds the length of eye, very close set and difficult to enumerate, 35 to 44 on lower limb of first arch; scales small, covering most of head; lateral line with a prominent arch, armed with deep bony scutes for its entire length, those on straight portion the strongest, each with a spine, forming a keel, the deepest about three-fourths the depth of eye, 35 to 45 in number, the curved portion usually notably shorter than the straight part; first dorsal with rather long, slender spines, connected by membrane; second dorsal and anal similar, scarcely elevated anteriorly, the last ray of each fin enlarged and nearly separate in adult; caudal broadly forked, the lobes of about equal length; ventrals rather small; pectorals long, the upper rays considerably produced, reaching to or nearly to beginning of straight part of lateral line, 3.16 to 4.4 in length of body.

Color bluish green above, pale or silvery below; opercle with a black spot on its edge above its posterior angle.

This species was not taken by us. It is here described from 10 specimens, ranging in length from 75 to 300 mm.

Known from nearly all warm and temperate seas. Specimens examined by us are from the Mediterranean Sea, Norway, Rhode Island, Florida, Chile and Japan.

253. Trachurus picturatus (Bowdich).

Seriola picturata Bowdich, Excursions in Madeira, 1825, 123, fig. 27 (Madeira).

Caranx trachurus Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 11 (Mediterranean; Valparaiso; part).

Caranx cuvieri Lowe, Trans. Zoöl. Soc. London, II, 1837, 183 (Madeira).

Caranx symmetricus Ayres, Proc. Cal. Ac. Sci., I, 1855, 62 (San Francisco).

Trachurus symmetricus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 260.

Trachurus fallax Capello, Journ. Sci. Math. Phys. Nat. Lisboa, 1867, 310-318 (Lisbon).

Caranx (Trachurus) cuvieri Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXI) Ichth. Beitr., II, 1875, 16.

Trachurus cuvieri Lütken, (Dan. Vid. Selsk. Skr., 5 ser., XII) Spolia Atlantica, 1880, 126.

Caranx picturatus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 269.

Trachurus picturatus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1883, 191; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 909.

Head 3.5 to 3.8; depth 4.5 to 5.3; D. VIII-I, 29 to 35; A. II-I, 25 to 29.

Body very elongate, little compressed; the back scarcely elevated; dorsal and ventral outlines about evenly convex; head low, little compressed; snout blunt, 3.05 to 3.4 in head; eye 3.34 to 3.9; mouth rather small, oblique; lower jaw projecting; maxillary reaching to or slightly past anterior margin of eye, 2.5 to 2.65 in head; teeth weak, in a single series in jaws; vomer, palatines and tongue with bands of villiform teeth; gill-rakers long and slender, about two-thirds the length of eye, very close set and difficult to enumerate, 35 to 40 on the lower limb of first arch; scales small, covering most of head; lateral line with a prominent arch, armed with rather narrow bony scutes for its whole length, those on straight portion the strongest, each with a spine, forming a keel, the deepest scutes slightly more than half the depth of eye, 40 to 50 in number, the curved portion as long as the straight part; first dorsal with rather slender spines, connected by membrane; second dorsal and anal similar, not much elevated anteriorly, the last ray of each fin enlarged, nearly separate in adult; caudal broadly forked, the lobes of about equal length; ventrals rather small; pectorals long, the upper rays more or less produced, but failing to reach beginning of straight part of lateral line, 3.8 to 4.3 in length of body.

Color bluish green above, pale or silvery below; opercle with a black spot on its edge above posterior angle.

This species was not taken by us. It is here described from 16 specimens, ranging in length from 130 to 280 mm.

A pelagic species, widely distributed in nearly all open seas. Abundant on coast of California, also recorded from the Galapagos Islands and Chile. Not as yet recorded from either coast of Panama, nor, in fact, from the entire Atlantic coasts of North and South America. Specimens examined are from California, "Punta Delgade", and "Europe".

103. Genus **Hemicaranx** Bleeker.

Hemicaranx Bleeker, Versl. Ak. Amsterdam, XIV, 1862, 135 (type *Caranx marginatus* Schlegel).

Carangops Gill, Proc. Ac. Nat. Sci. Phila., 1862, 238 (type *Caranx heteropygus* Poey).

Head small; maxillary very narrow; teeth in the jaws in a single, close set, series, few or none on vomer, palatines, and tongue; dorsal

and anal rather low anteriorly, never with salient lobes, each with a wide sheath of scales at base. Other characters essentially as in *Caranx*.

KEY TO THE SPECIES.

a. Dorsal and anal anteriorly more or less elevated, the outer margins of fins not evenly convex; pectoral fin falcate, reaching much beyond beginning of straight portion of lateral line; dorsal spines long and flexible; body without evident cross-bars.

b. Dorsal and ventral outlines about evenly curved; caudal deeply forked, the upper lobe produced in adult, its longest rays nearly equal to depth of body; color pale bluish or brownish above; base of pectoral without a large black blotch. *amblyrhynchus*, p. 341.

bb. Dorsal outline anteriorly more strongly curved than the ventral; caudal moderately forked, the upper lobe not much produced and not equal to depth of body; color bluish black above; base of pectoral with a large jet black blotch.

c. Snout rather blunt, its anterior profile gently elevated; maxillary short, reaching to or slightly past anterior margin of eye, 3.1 to 3.45 in head; pectorals long, 2.45 to 2.9 in length of body; fins mostly yellowish green. *atrimanus*, p. 342.

cc. Snout very blunt, its anterior profile strongly elevated; maxillary longer, reaching anterior margin of pupil, 2.7 to 3.06 in head; pectorals shorter, 3.28 to 3.84 in body; fins mostly blackish. *zelotes*, p. 343.

aa. Dorsal and anal anteriorly not elevated, the outer margins of fins evenly convex; pectorals not falcate, reaching beginning of lateral line; dorsal spines short and stiff; body with evident cross-bars, at least in young.

d. Anterior profile strongly convex over snout, ascending in an almost straight oblique line from posterior nostril to first dorsal; lateral scutes moderately developed; dorsal and anal high, the longest rays equal to eye and postorbital part of head, the last rays of fins usually reaching base of outer caudal rays; caudal little forked, the lobes subequal, broad and round. *leucurus*, p. 344.

dd. Anterior profile nearly evenly convex; lateral scutes very strongly developed; dorsal and anal low, the longest rays equal to postorbital part of head, the last rays not nearly reaching

base of outer caudal rays; caudal moderately forked, the lobes subequal, and rather pointed.

rhomboides sp. nov., p. 345.

254. Hemicaranx amblyrhynchus (Cuvier & Valenciennes).

Caranx amblyrhynchus Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 100, Pl. CCXLVIII (Brazil).

Caranx falcatus Holbrook, Ichth. South Carolina, Ed. II, 1860, 94, Pl. XIII, fig. 2 (Charleston).

Caranx heteropygus Poey, Memorias, II, 1861, 344 (Cuba).

Carangops falcatus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 435.

Carangops heteropygus Poey, Enumeratio, 1875, 77.

Hemicaranx amblyrhynchus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 912, Pl. CXLI, fig. 386; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 44.

Head 4.01 to 4.4; depth 2.04 to 2.5; D. VII-I, 27 or 28; A. II-I, 24; P. 20 to 22; lateral scutes 44 to 51.

Body oval, much compressed; the back elevated; dorsal and ventral outlines about evenly curved, the former slightly carinate anteriorly; head short and deep; snout blunt, 3.8 to 4.35 in head; eye 3.35 to 3.5; mouth oblique; jaws subequal; maxillary reaching anterior margin of pupil, 2.74 to 2.9 in head; teeth on vomer minute or wanting; palatines and tongue with bands of minute teeth, those on jaws larger, in a single series, pointed, and rather close set; preopercle with a striated membranous border; gill-rakers slightly more than half as long as eye, 18 to 21 on lower limb of first arch; scales very small, cycloid; breast scaly; head and a small triangular patch in front of spinous dorsal naked, except for a few scattered scales on postorbital regions; lateral line with a high arch anteriorly, which is as long as head, the straight portion armed with strong scutes, each one bearing a flattened spine, forming a lateral keel; first dorsal with slender spines, connected by membrane; second dorsal and anal similar, only slightly elevated anteriorly, none of the anterior rays reaching past tips of succeeding rays when deflexed, each fin with a very wide sheath of scales at base, no scales on fins; caudal deeply forked, the upper lobe the longer, much produced in adult, its longest rays longer than pectorals, equal to depth of body; ventrals small; pectorals long and falcate, 3.16 to 3.6 in body.

Color bluish or brownish above, sides silvery; a black opercular spot; fins mostly yellowish green in life; dorsal and caudal with black margin; axil of pectoral dusky.

Only 3 specimens, ranging from 170 to 260 mm. in length, were taken. The above description is based on these and other specimens from South Carolina and Florida.

Known from Cape Hatteras to Brazil. Our specimens are from Fox Bay, Colon, and Colon market.

255. Hemicaranx atrimanus (Jordan & Gilbert).

Caranx atrimanus Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 308 (Panama).

Hemicaranx atrimanus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 913; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 75; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 97.

Head 3.64 to 4.4; depth 2.2 to 2.56; D. VII-I, 26 or 27; A. II-I, 22 to 24; P. 21 or 22; lateral scutes 47 to 57.

Body elliptical, much compressed; the back elevated; the dorsal outline more strongly convex than the ventral, slightly carinate in front of first dorsal; head rather small; snout rather blunt, its anterior profile gently elevated, 3.8 to 4.3 in head; eye 3.2 to 3.8; mouth oblique; jaws subequal; maxillary reaching to or slightly past anterior margin of eye, 3.1 to 3.45 in head; teeth on vomer, palatines, and tongue very small or wanting, those on jaws small, in a single, close set series; preopercle with a striated membranous border; gill-rakers slightly more than half the length of eye, 18 to 20 on the lower limb of first arch; scales minute, cycloid; breast scaly; head and a triangular patch in front of spinous dorsal naked, except for scattered scales on postorbital regions; lateral line with a large arch anteriorly, which is usually notably longer than head, the straight portion armed with rather strong scutes, of about the width of the pupil, each scute with a compressed spine, forming a keel; first dorsal with slender spines, connected by membrane, the longest equal to length of snout; second dorsal and anal similar, not greatly elevated anteriorly, the longest rays not reaching past the tips of any of the succeeding rays when deflexed; each fin with a wide sheath of scales at base; no scales on fins; caudal deeply forked, the upper lobe the longer, moderately produced in adult, its longest rays shorter than pectorals, and not quite equal to depth of body; ventrals small; pectorals very long and falcate, 2.45 to 2.9 in body.

Color bluish black above, silvery below, usually shaded with more or less dusky; snout and opercles dusky; cheeks and under surface of head specked with dark points; dorsal dusky; caudal, anal and

pectorals yellowish green; caudal edged with black; pectorals with a jet black blotch, involving the axil of fin and the base of all except the lowest rays.

Of this species 9 specimens were secured, ranging from 225 to 315 mm. in length.

Known only from Panama Bay. Our specimens are all from the Panama City market.

256. Hemicaranx zelotes Gilbert.

Hemicaranx zelotes Gilbert, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2845 (Panama); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 76, Pl. XII, fig. 22; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 98.

Head 4.5; depth 2.3 to 2.73; D. VIII-I, 27 to 30; A. II-I, 23 to 25; P. 20 to 22; lateral scutes 46 to 54.

Body elliptical, compressed; the dorsal outline anteriorly more strongly convex than ventral, carinate in front of spinous dorsal; head small; snout very blunt, its anterior profile much elevated, 3.9 to 4.5 in head; eye 3.1 to 3.5; mouth oblique; jaws subequal; maxillary reaching anterior margin of pupil, 2.7 to 3.06 in head; teeth on vomer, palatines and tongue minute or wanting, those on jaws small, in a single, close set series; preopercle with a striated membranous border; gill-rakers about half the length of eye, 16 to 20 on the lower limb of first arch; scales minute, cycloid; breast scaly; head and a triangular patch in front of first dorsal naked, except for a few scattered scales on postorbital regions; lateral line anteriorly with a high arch, usually not exceeding the head in length, the straight portion armed with strong scutes, which are slightly more than half as wide as eye, forming a keel; first dorsal with slender spines, connected by membrane, the longest scarcely as long as snout; second dorsal and anal similar, little elevated anteriorly, the longest rays not reaching past the tips of any of the succeeding rays when deflexed, each fin with a wide sheath of scales at base, no scales on fins; caudal deeply forked, the upper lobe the longer, its longest rays longer than pectorals, but shorter than depth of body; ventrals small; pectorals rather long and falcate, 3.28 to 3.84 in length of body.

Color bluish black above, silvery below, with dusky shades; snout, mandible and upper part of opercles black; cheeks and subopercle sprinkled with dark points; fins dusky or blackish; pectorals as in *H. atrimanus*.

Of this species 7 specimens, ranging from 230 to 275 mm. in length, were secured. It is closely related to *H. atrimanus*, from which it may be distinguished by its blunter snout, more strongly ascending profile, longer maxillary, shorter pectorals and darker coloration. Usually the curved portion of the lateral line is notably shorter, but, as this is a variable character, it is untrustworthy.

Known only from Panama Bay. Our specimens are from Balboa and the Panama City market.

257. Hemicaranx leucurus (Günther). (Plate XXV, fig. 1.)

Caranx leucurus Günther, Proc. Zoöl. Soc. London, 1864, 24 (Panama), and Trans. Zoöl. Soc. London, VI, 1869, 430.

Caranx fürthii Steindachner, (Sitzb. k. Akad. Wiss. Wien, LXXII) Ichth. Beitr., IV, 1875, 12 (Panama).

Hemicaranx fürthii Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 914.

Hemicaranx leucurus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 914; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 98.

Head 3.03 to 3.54; depth 1.9 to 2.26; D. VIII-I, 26 to 30; A. II-I, 22 to 25; P. 20 to 22; lateral scutes 39 to 45.

Body elliptical, strongly compressed; the back much elevated; anterior profile strongly convex over snout, ascending in a nearly straight, oblique line from posterior nostril to origin of spinous dorsal; ventral outline anteriorly gently convex; head short and low; snout blunt, 3.4 to 4.35 in head; eye 3.7 to 4.35; mouth oblique; jaws subequal; maxillary reaching anterior margin of eye, 2.6 to 3.2 in head; teeth in jaws small, in a single, close set series; vomer, palatines and tongue toothless; preopercle strongly serrate; gill-rakers slightly more than half the length of eye, 16 to 20 on the lower limb of first arch; scales minute; breast scaly; head naked; lateral line with a prominent arch, which is slightly shorter than head, the straight portion armed with rather strong scutes, which only in our largest specimens (100 mm. long) bear spines; first dorsal with short stiff spines, connected by membrane, the longest scarcely as long as eye; second dorsal and anal similar, of equal height, not elevated anteriorly, their margins evenly convex, longest rays equal to eye and postorbital part of head, the posterior rays usually reaching base of outer rays of caudal; each fin with a sheath of scales at base; caudal slightly forked, the lobes broad and round, subequal, as long as pectorals; ventrals small; pec-

torals short and broad, reaching beginning of straight portion of lateral line, 4.45 to 4.85 in length of body.

Color variable, dark brown to pale yellowish; sides with 4 to 8 dark cross-bars; specimens with few bars lighter in color and the bars much wider; our largest specimen and several very small specimens with indistinct bars; a few of the very smallest specimens (25 mm. long) without trace of bars; the first bar usually forms a big, black blotch on opercle; rarely also a bar across the eyes; caudal pale or yellowish; other fins dusky or black.

Of this species there are 125 specimens in the present collection, ranging from 25 to 107 mm. in length. No doubt remains of the identity of this species and *Caranx fürthii* Steindachner. The latter was described as having a shorter head (3.5 in length of body), and differing from the former in the presence of a spine on each lateral scute. Both of these are clearly age characters. In our longest specimen, 107 mm. long, the head is contained 3.54 times in length of body, and each scute bears a well developed spine. In specimens of about 80 mm. and less in length there is no trace of spines, but on slightly larger specimens spines begin to appear on the posterior scutes. When the fish reaches a length of about 100 mm. or more, each scute is provided with a well developed spine. Günther's type specimens of *H. leucurus* were 3 inches long. Steindachner's type specimens of *H. fürthii* were from 3 to 5 inches in length.

Known only from Panama Bay. Our specimens are all from Chame Point.

258. Hemicaranx rhomboides sp. nov. (Plate XXV, fig. 2.)

Type No. 81758, U. S. N. M.; length 75 mm.; Fox Bay, Colon, Panama.

Head 3.0 to 3.3; depth 2.0 to 2.1; D. VIII-I, 27 to 29; A. II-I, 24; P. 20; lateral scutes 38 to 42.

Body elliptical, strongly compressed; the back elevated; anterior profile about evenly convex; ventral outline anteriorly not quite as convex as the dorsal; head short and rather deep; snout blunt, 3.7 to 4.25 in head; eye 3.7 to 4.25; mouth oblique; jaws subequal; maxillary reaching anterior margin of eye, 3.1 to 3.2 in head; teeth in the jaws small, in a single, close set series, those on vomer and palatines obsolete; tongue with a very narrow band of minute teeth; preopercle strongly serrate; gill-rakers slightly more than half the length of eye, 15 to 17 on the lower limb of first arch; scales minute, cycloid; breast scaly; head and a triangular patch in front of spinous

dorsal naked; lateral line with a high arch, being equal to eye and postorbital part of head; straight portion armed with strong scutes, each of which bears a small spine in our larger specimen, these obsolete in the smaller one; first dorsal with stiff spines, connected by membrane, the longest scarcely as long as eye; second dorsal and anal similar, of equal height, not elevated anteriorly, their margins evenly convex, the longest rays as long as postorbital part of head, the posterior rays not nearly reaching base of outer rays of caudal; each fin with a sheath of scales at base; caudal moderately forked, the lobes subequal, slightly pointed, but not produced, longer than pectoral; ventrals small; pectorals short and broad, reaching beginning of straight portion of lateral line, 4.5 to 4.9 in length of body.

Color pale yellowish; sides with 5 broad, dark brown cross-bars, the first crossing opercles, leaving a big black blotch on opercle; lower parts of head and body with numerous dark points; dorsal, anal, and ventrals black; pectorals and caudal pale.

The species is the Atlantic representative of *H. leucurus*, from which it is separated with difficulty. It, however, appears to have a more evenly curved anterior profile, lower dorsal and anal, a more deeply forked caudal, and notably stronger and wider lateral scutes.

From *H. secundus* Poey (Memorias, II, 1860, p. 223), if the description can be relied upon, it differs in the fewer pectoral rays, 30 being the number given for *H. secundus*. Poey described the pectoral fins as long and falcate; in our immature specimens they are short and rounded. The maxillary is said to reach past anterior fourth of eye; in our specimens it reaches only to anterior margin of eye. Poey's description was, however, based on a specimen 425 mm. in length. Some of the differences noted may, therefore, be due to age.

Only 2 specimens, respectively 55 and 75 mm. in length, were taken in Fox Bay, Colon.

104. Genus **Caranx** Lacépède.

Caranx Lacépède, Hist. Nat. Poiss., III, 1802, 57 (type *Scomber carangus* Bloch=*Caranx hippos* Linnæus; as restricted by Bleeker).

Tricropterus Rafinesque, Caratteri, etc., 1810, 41 (type *Scomber carangus* Bloch=*Scomber hippos* Linnæus).

Carangus Griffith, in Cuvier, Animal Kingdom, X, 1834, 335 (type *Scomber carangus* Bloch=*Scomber hippos* Linnæus).

Paratractus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 330 (type *Caranx pisquetos* Cuvier & Valenciennes=*Scomber crysos* Mitchill).

Body ovate or oblong, compressed; dorsal profile sometimes strongly convex, sometimes only gently arched; head rather large, compressed; snout usually blunt; mouth moderate or large, oblique; jaws usually subequal; maxillary with a well developed supplemental bone; premaxillary protractile; teeth in the jaws more or less unequal, in one or a few series; villiform teeth usually present on vomer, palatines, and tongue, deciduous or wanting in some species; preopercle with a membranous border, which is usually more or less serrate; gill-rakers long; scales small; lateral line posteriorly armed with bony plates; first dorsal with rather slender spines depressed in a groove; second dorsal and anal similar, usually more or less elevated anteriorly, the anal preceded by 2 rather strong spines; caudal fin strongly forked; pectoral fins long and falcate in adult, moderate in young.

KEY TO THE SPECIES.

a. Arch of lateral line very long and low, much longer than straight portion; lips thick, papillose; teeth on vomer deciduous or wanting; D. VIII-I, 25; A. II-I, 21; lateral scutes 23; gill-rakers, exclusive of rudiments, 21. *guara*, p. 349.

aa. Arch of lateral line moderate or high, usually shorter than straight portion, never notably longer.

b. Gill-rakers rather few, 13 to 18, exclusive of rudiments, on the lower limb of the first arch.

c. Breast naked, with only a small triangular patch of scales in front of ventrals; a large opercular spot present. *hippos*, p. 350.

cc. Breast covered with small scales; opercular spot present or wanting.

d. Second dorsal and anal scarcely elevated anteriorly, the fins completely covered with minute scales; no opercular spot. *bartholomæi*, p. 351.

dd. Second dorsal and anal moderately, or strongly elevated anteriorly, only the elevated portions of fins with minute scales.

e. General color brassy or blackish; vertical fins dusky or black; no opercular spot; none of the mandibular teeth enlarged.

f. Second dorsal and anal very strongly elevated anteriorly, the produced rays reaching to or past the middle of base of fins; gill-rakers 17 or 18; color nearly uniform brownish black. *lugubris*, p. 352.

ff. Second dorsal and anal only moderately elevated, the longest rays not reaching the middle of base of fins; gill-rakers 15 or 16; sides with many scattered dark spots. *melampygus,* p. 353.

ee. General color silvery, the vertical fins mostly pale, or yellowish green in life; a small opercular spot present; some of the mandibular teeth enlarged, canine-like.

g. Lateral scutes 35 to 38; D. VIII-I, 20 to 23; A. II-I, 17 or 18.

h. Snout short, 3.46 to 3.7 in head; maxillary 2.0 to 2.2; gill-rakers 13 or 14; D. VIII-I, 20 to 22; A. II-I, 17 or 18. *latus,* p. 354.

hh. Snout rather long, 2.9 to 3.0 in head; maxillary 2.4 to 2.5; gill-rakers 17 or 18; D. VIII-I, 22 or 23; A. II-I, 18. *medusicola,* p. 355.

gg. Lateral scutes 25 to 30; D. VIII-I, 19 or 20; A. II-I, 15 to 17; gill-rakers 15 to 18. *marginatus,* p. 356.

bb. Gill-rakers numerous, 24 to 32, exclusive of rudiments, on the lower limb of first arch; second dorsal and anal little elevated anteriorly.

i. Second dorsal and anal long, the former with 27 or 28 rays, and the latter with 23 or 24; lateral scutes 30 to 35; gill-rakers 30 to 32. *ruber,* p. 357.

ii. Second dorsal and anal shorter, the former with 22 to 25 rays, and the latter with 19 to 24; lateral scutes 38 to 52; gill-rakers fewer than 30.

j. Body strongly compressed, dorsal profile much more strongly convex than the ventral; second dorsal and anal scarcely elevated anteriorly, with a very wide sheath of scales at base, the fins themselves without scales; body with 8 or 9 dark cross-bars. *vinctus,* p. 358.

jj. Body fusiform, not very strongly compressed, the dorsal and ventral outlines about evenly rounded; second dorsal and anal slightly elevated anteriorly, each with a rather narrow sheath of scales at base, the fins wholly or partly covered with small scales; body without dark cross-bars.

k. Body moderately deep, its depth 2.8 to 3.0 in its length; maxillary 2.3 to 2.5 in head; second dorsal and anal completely covered with minute scales; gill-rakers 24 or 25. *crysos,* p. 358.

kk. Body elongate, its depth 3.1 to 3.5 in its length; maxillary 2.6 to 2.75 in head; second dorsal and anal with scales on elevated portion only; gill-rakers 27 to 29. *caballus,* p. 359.

259. Caranx guara (Bonnaterre).

Scomber guara Bonnaterre, Tableau Encyclo., Ichth., VI, 1788, 139, Pl. LVIII.

Scomber dentex Bloch & Schneider, Syst. Ichth., 1801, 30 (Brazil).

Caranx luna Geoffroy St. Hilaire, Descr. Egypte, Poiss., about 1820, Pl. XXIII (Egypt).

Citula banksi Risso, Hist. Nat. Princ. Prod. l'Europe, III, 1826, 422 (Nice).

Caranx solea Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 86 (Brazil).

Caranx dentex Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 87.

Caranx analis Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 88 (St. Helena).

Caranx guara Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 926.

Head 2.7; depth 2.9; D. VIII-I, 25; A. II-I, 21; lateral scutes 23.

Body elongate, compressed; dorsal profile about evenly convex, only slightly carinate in front of spinous dorsal; lower outline anteriorly only gently rounded; head long; snout very long and rather pointed, 2.2 in head; eye 5.7; mouth oblique, jaws about subequal; lips, unlike in other species of the genus, thick and papillose; maxillary not reaching anterior margin of eye, 2.65 in head; teeth present on both jaws, palatines, and tongue, none on vomer, those in jaws in a single row; preopercle with a serrate membranous border; gill-rakers rather short and strong, 21, exclusive of rudiments, on the lower limb of the first arch; scales small, cycloid; breast anteriorly partly without scales; cheeks, opercles and postorbital regions mostly scaly, rest of head scaleless; lateral line with a very low arch anteriorly, which is much longer than the straight portion; lateral scutes few and weak, caudal peduncle without a very prominent keel; first dorsal with rather slender spines; second dorsal and anal only very slightly elevated anteriorly, each with a sheath of scales at base, the fins themselves without scales; ventrals reaching vent; pectorals long and falcate, 3.1 in length of body.

Color bluish above, sides silvery; a prominent opercular spot present; dorsals, caudal and anal with dusky; other fins mostly pale.

This species was not taken by us. The above description is based on a single specimen, 515 mm. long, taken by the Albatross at Easter Island.

Known from the tropical parts of the Atlantic and the South Pacific. Not as yet recorded from either coast of Panama.

260. Caranx hippos (Linnæus).

Scomber hippos Linnæus, Syst. Nat., Ed. XII, 1766, 494 (Charleston, S. C.).

Scomber carangus Bloch, Naturg. Ausl. Fische, VII, 1793, 69, Pl. CCCXL (East and West Indies).

Caranx erithrurus Lacépède, Hist. Nat. Poiss., III, 1802, 68 (South Carolina; based on *Scomber hippos* Linnæus).

Caranx daubentonii Lacépède, Hist. Nat. Poiss., III, 1802, 71 (Martinique; on a drawing by Plumier).

Caranx carangua Lacépède, Hist. Nat. Poiss., III, 1802, 59, 74 (Martinique; on a drawing by Plumier).

Caranx xanthopygus Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 109 (Isle de France).

Caranx ekala Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 117 (Vizagapatam; after *Ekalah parah* Russell).

Caranx antillarum Bennett, Whaling Voyage, II, 1840, 282 (West Indies).

Caranx defensor DeKay, Fauna N. Y., Fishes, 1842, 120, Pl. XXIV, fig. 72 (New York).

Carangus esculentus Girard, U. S. & Mex. Bound. Surv., II, Pt. II, Fishes, 1859, 23, Pl. XI, figs. 1-3 (Brazos Santiago, Texas).

Carangus chrysos Gill, Proc. Ac. Nat. Sci. Phila., 1862, 434 (young).

Carangus hippos Gill, Proc. Ac. Nat. Sci. Phila., 1862, 434.

Caranx caninus Günther, Trans. Zoöl. Soc. London, VI, 1869, 432 Panama).

Caranx hippos Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 269; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 920, Pl. CXLI, fig. 387; Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 3; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 77; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 99; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 401, 409 (Colon; Panama), and 1917, 131 (Colon).

Head 2.95 to 3.33; depth 2.2 to 3.0; D. VII or VIII-I, 18 to 21; A. II-I, 16 or 17; lateral scutes about 25 to 40.

Body robust, compressed; upper profile very strongly convex anteriorly, slightly carinate in front of spinous dorsal; lower outline only slightly curved anteriorly; head short and deep; snout very blunt, 3.3 to 4 in head; eye 2.8 to 4.65; mouth slightly oblique; jaws subequal; maxillary reaching posterior margin of eye, 2.1 to 2.44 in head; teeth present on both jaws, vomer, palatines and tongue, some of the teeth in the jaws enlarged, canine-like; preopercle with a slightly serrate

membranous border; gill-rakers rather long, 13 to 15, besides rudiments, on the lower limb of the first arch; scales small, cycloid; breast naked, with only a small triangular patch of scales in front of ventrals; cheeks and postorbital regions mostly scaled, rest of head without scales; lateral line with a long low arch, which is usually only slightly shorter than straight portion; lateral scutes strong posteriorly, forming a strong keel on caudal peduncle; alimentary canal short; stomach with heavy muscular walls; first dorsal with slender spines, the first very short and disappearing with age; second dorsal and anal moderately elevated anteriorly, each with a very low scaly sheath at base, the fins themselves with few or no scales; ventrals not quite reaching vent in large examples, reaching past vent to origin of anal in young; pectorals long and falcate in adult, proportionately much shorter in young, 2.6 to 4.1 in length of body.

Color bluish green above, sides with a brassy luster; head mostly dusky, with a very prominent opercular spot; young with 5 or 6 dark cross-bars; fins mostly yellowish green in life; dorsal and caudal dusky, especially on their margin; axil of pectoral black; the lower rays of pectoral with a black blotch, this indistinct or wanting in young.

We have 120 specimens of this species, ranging from 40 to 450 mm. in length. Of these 50 are from the Atlantic coast and 70 from the Pacific. A careful comparison of our large series from the two coasts discloses no differences of importance. The ventral fins in the Atlantic specimens usually reach to or past the vent, while in Pacific specimens, 230 mm. or more in length, they usually do not quite reach the vent. The Pacific specimens average a slightly larger number of anal rays and gill-rakers. The contents of stomachs examined consisted of small fish.

A widely distributed species; common on both coasts of tropical America. Our Atlantic coast specimens are from Toro Point; Mindi Cut; Mindi Reef; Colon market; Fox Bay, Colon; and Porto Bello. Pacific coast specimens are from Chame Point; tide streams, Corozal; tide streams, Balboa; Panama Bay, Balboa, and the Panama City market.

261. Caranx bartholomæi Cuvier & Valenciennes.

Caranx bartholomæi Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 100 (St. Bartholomew); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 919; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 131 (Colon).

Caranx cibi Poey, Memorias, II, 1860, 224 (Cuba).

Caranx beani Jordan, Proc. U. S. Nat. Mus., 1880, 486 (Beaufort, N. C.).

Head 2.8 to 3.25; depth 2.0 to 2.7; D. VIII-I, 26 to 28; A. II-I, 22 to 24; lateral scutes about 22 to 35.

Body rather deep, compressed; upper profile evenly convex, slightly carinate anteriorly; lower outline not quite as strongly convex as the upper; head rather short and blunt; snout moderate, 2.76 to 3.4 in head; eye 2.8 to 3.96; mouth oblique; jaws subequal; maxillary reaching slightly past anterior margin of eye, 2.25 to 2.5 in head; teeth small, present on both jaws, vomer, palatines and tongue; preopercle with a slightly serrate membranous border; gill-rakers rather short, 17 or 18, besides rudiments, on lower limb of first arch; scales very small, cycloid; breast fully scaled; cheeks and postorbital regions mostly scaly; rest of head without scales; lateral line with a long, low arch, equal to or longer than the straight portion; lateral scutes weak; first dorsal with slender spines; second dorsal and anal only slightly elevated anteriorly, each with a scaly sheath at base, the fins themselves completely covered with minute scales; ventrals reaching to or slightly past vent; pectorals long and falcate in adult, proportionately much shorter in young, 2.8 to 4.25 in length of body.

Color bluish green above, sides silvery; young with irregular brownish cross-bars; no opercular spot; spinous dorsal dusky, the fins mostly pale in spirits, yellowish green in life.

This species is represented by 39 specimens, ranging from 40 to 150 mm. in length.

Known from North Carolina southward to Panama. Our specimens are from Toro Point; Fox Bay, Colon, and Porto Bello.

262. Caranx lugubris Poey.

Scomber ascensionis Bloch & Schneider, Syst. Ichth., 1801, 33 (not *Scomber ascensionis* of Osbeck, which may be *Caranx guara*).

Caranx ascensionis Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 102.

Caranx lugubris Poey, Memorias, II, 1860, 222 (Cuba); Snodgrass & Heller, Proc. Wash. Ac. Sci., VI, 1905, 365.

Caranx frontalis Poey, Memorias, II, 1860, 222 (Cuba).

Carangus lugubris Poey, Syn. Pisc. Cub., 1868, 365.

Head 3.15 to 3.5; depth 2.34 to 2.7; D. VII or VIII-I, 21 or 22; A. II-I, 17 to 19; lateral scutes 26 to 30.

Body deep, strongly compressed; dorsal profile strongly convex anteriorly, concave in front of eyes in largest specimens, carinate in front of spinous dorsal; lower outline only feebly rounded; head deep; snout rather long, 2.6 to 2.95 in head; eye 4.05 to 4.7; mouth notably oblique; lower jaw slightly projecting; maxillary reaching anterior margin of pupil, 2.2 to 2.5 in head; teeth present on both jaws, vomer, palatines, and tongue, only the outer ones in upper jaw enlarged; preopercle with a finely serrate membranous border; gill-rakers rather strong, 17 or 18, exclusive of rudiments, on the lower limb of first arch; scales small, cycloid; breast fully scaled; cheeks scaled; postorbital regions and portions of opercle also scaly, rest of head scaleless; lateral line with a prominent arch anteriorly which is about two-thirds the length of the straight portion; lateral scutes strong; first dorsal with slender spines, the first very short, disappearing in large individuals; second dorsal and anal strongly elevated anteriorly, the produced rays reaching to or past middle of base of fins, each with a very low sheath of scales on first half of base, the fins with a few scales on the elevated portion only; ventrals reaching to or past vent; pectorals very long and falcate, 2.5 to 2.7 in head.

Color of alcoholic specimens uniform brownish black; no opercular spot; fins all black or dusky.

This species was not obtained by us. We have examined 6 large specimens from the U. S. National Museum collection, ranging from 335 to 500 mm. in length. Of these 3 are from Clarion Id., 2 from Socorro Id., and 1 from Cuba. We are unable to find any differences between the Atlantic and the Pacific specimens.

Known principally from rocky islands in the tropical parts of the Atlantic and Pacific. Not as yet recorded from either coast of Panama.

263. Caranx melampygus Cuvier & Valenciennes.

Caranx melampygus Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 116 (East Indies); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 230; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 925; Snodgrass & Heller, Proc. Wash. Ac. Sci., VI, 1905, 365.

Caranx bixanthopterus Rüppell, Neue Wirbelthiere, 1837, 49 (Red Sea).

Caranx stellatus Eydoux & Souleyet, Voy. Bonite, Poiss., 1841, 167 (Hawaiian Islands).

Head 3.1 to 3.4; depth 2.3 to 2.9; D. VIII-I, 21 to 23; A. II-I, 18 or 19; lateral scutes 28 to 36.

Body elongate, much compressed; the upper profile strongly convex anteriorly, carinate in front of spinous dorsal; lower outline little convex anteriorly; head rather short; snout rather long and pointed, 2.6 to 3.46 in head; eye 3.46 to 5.4; mouth slightly oblique; jaws subequal; maxillary reaching to or slightly past anterior margin of eye, 2.5 to 2.65 in head; teeth present on both jaws, vomer, palatines and tongue, the outer ones in upper jaws slightly enlarged; preopercle with a serrate membranous border; gill-rakers rather slender, 15 or 16, exclusive of rudiments, on the lower limb of first arch; scales small, cycloid; breast fully scaled; cheeks and postorbital regions mostly scaly, the rest of head scaleless; lateral line anteriorly with a rather prominent arch, about three-fourths the length of the straight portion; lateral scutes moderate; first dorsal with slender spines; second dorsal and anal moderately elevated anteriorly, the produced rays not reaching middle of base of fins, each with a sheath of scales at base, only the elevated portions of fins with small scales; ventrals reaching to or past vent; pectorals long and falcate in adult, much shorter in young, 2.7 to 3.2 in length of body.

Color brownish black, or silvery; no opercular spot; head and sides with scattered black spots, these wanting in young; fins mostly dusky or black.

This fish was not taken by us. It is a widely distributed species, occuring about islands in the Pacific Ocean. We have examined one specimen, 420 mm. long, from Cocos Island and several smaller specimens from Vavan Tonga Islands. The latter are not nearly as dark in color as the large specimen.

264. Caranx latus Agassiz. (Plate XXVI, fig. 1.)

Caranx latus Agassiz, in Spix, Pisc. Brasil., 1831, 105 (Brazil); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 923, Pl. CXLII, fig. 389; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 132 (Colon).

Caranx lepturus Agassiz, in Spix, Pisc. Brasil., 1831, 106 (Brazil).

Caranx fallax Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 95 (Antilles; Brazil).

Caranx richardi Holbrook, Ichth. South Carolina, Ed. II, 1860, 94, Pl. XIII, fig. 1 (South Carolina).

Carangus fallax Gill, Proc. Ac. Nat. Sci. Phila., 1862, 433.

Caranx aureus Poey, Enumeratio, 1875, 76 (Cuba).

Head 2.9 to 3.2; depth 2.3 to 2.6; D. VIII-I, 20 to 22; A. II-I, 17 or 18; lateral scutes 35 to 38.

Body elongate, compressed; the upper profile anteriorly very strongly convex, carinate; lower outline anteriorly little curved; head rather large; snout blunt, 3.46 to 3.7 in head; eye 3.1 to 3.6; mouth oblique; jaws subequal, or the lower slightly projecting; maxillary reaching posterior margin of pupil, 2.0 to 2.2 in head; teeth present on both jaws, vomer, palatines and tongue, some of the outer ones in the jaws enlarged, canine-like; preopercle with a slightly serrate membranous border; gill-rakers rather slender, 13 or 14, exclusive of rudiments, on the lower limb of the first arch; scales small, cycloid; breast fully scaled; cheeks scaly; postorbital regions with few scattered scales, the rest of head scaleless; lateral line anteriorly with a strong arch, which is about three-fourths the length of the straight portion; lateral scutes of moderate size, forming a distinct keel on caudal peduncle; first dorsal with slender spines; second dorsal and anal only moderately elevated anteriorly, each with a very low sheath of scales at base; ventrals reaching from slightly past vent nearly to origin of anal; pectorals long and falcate in adult, proportionately much shorter in young, 2.75 to 4.3 in length of body.

Color bluish above, sides silvery; very young with 5 or 6 dark cross-bars; a small opercular spot present, another very small black spot at upper anterior angle of opercle; spinous dorsal and elevated portion of soft dorsal black; caudal with more or less dusky; other fins pale in spirits, yellowish green in life.

This is the most abundant of all the species of this genus on the Atlantic coast of Panama. One hundred and ten specimens, ranging from 40 to 250 mm. in length, were preserved.

Known from the Atlantic coast of tropical America. All Pacific coast records we believe to be referable to either *C. marginatus* or *C. medusicola*. (See Gilbert & Starks, Fishes of Panama Bay, Memoir. Cal. Ac. Sci., Vol. IV, 1904, p. 78.) Our specimens are from Toro Point; Creek near Mindi Cut; Mindi Cut; Fox Bay, Colon; Colon market; Rio Cascajal, Porto Bello, and Porto Bello Bay.

265. Caranx medusicola Jordan & Starks.

Caranx medusicola Jordan & Starks, in Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 430 (Mazatlan); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 924, Pl. CXLIII, fig. 390; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 78.

This species was not seen by us. It is recorded as (Gilbert & Starks, 1904, p. 78) differing from *C. marginatus* in having a deeper body, and more plates in the lateral line, 36 to 38. From *C. latus* it is said to dif-

fer: in the shorter maxillary, 2.4 to 2.5 in head; in the longer snout, 2.9 to 3.0 in head; in the more numerous gill-rakers, 17 or 18 on the lower limb of the first arch; and in the slightly more numerous dorsal and anal rays, 22 or 23 dorsal rays, 18 anal rays.

Recorded from Mazatlan and Clarion Island.

266. Caranx marginatus (Gill). (Plate XXVI, fig. 2.)

Carangus marginatus Gill, Proc. Ac. Nat. Sci. Phila., 1863, 166 (Panama).

Caranx hippos Günther, Trans. Zoöl. Soc. London, Vol. VI, 1869, 431 (in part).

Caranx latus Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 180.

Caranx marginatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 922; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 78; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 99.

Head 3.05 to 3.3; depth 2.24 to 2.7; D. VIII-I, 19 or 20; A. II-I, 15 to 17; lateral scutes 25 to 30.

Body rather deep, compressed; dorsal profile rather strongly and evenly convex, carinate in front of spinous dorsal; lower outline not as strongly curved as the upper; head rather large; snout blunt, 3.2 to 3.85 in head; eye 3.1 to 3.6; mouth oblique; jaws subequal, or the lower slightly projecting; maxillary reaching to or slightly past middle of eye, 2.05 to 2.45 in head; teeth present on both jaws, vomer, palatines and tongue, some of the outer ones in the jaws enlarged, canine-like; preopercle with a smooth membranous border; gill-rakers rather long, 15 to 18, exclusive of rudiments, on the lower limb of first arch; scales small, cycloid; breast fully scaled; cheeks and postorbital regions mostly with scales, the rest of head scaleless; lateral line with a prominent arch anteriorly, which is about two-thirds the length of the straight portion; lateral scutes rather large, forming a distinct keel on caudal peduncle; first dorsal with slender spines; second dorsal and anal moderately elevated anteriorly, each with a very low scaly sheath at base of first half of fins, only the elevated portion of fins covered with small scales; ventrals reaching slightly past vent in adult and nearly to origin of anal in young; pectorals long and falcate in adult, proportionately much shorter in young, 2.7 to 4.0 in length of body.

Color bluish above, sides silvery; young with 5 or 6 dark cross-bars, which disappear with age; a small opercular spot present, another small spot above it at the upper anterior angle of opercle; spinous dorsal and the elevated portion of the second dorsal usually dusky; other fins mostly plain.

This species is represented by 19 specimens, ranging from 55 to 105 mm. in length. It is very closely related to *C. latus,* from which it, however, may be separated by the fewer scutes in the straight portion of the lateral line, and by the more numerous gill-rakers. It also averages a smaller number of dorsal and anal rays.

Known from Mazatlan to Panama Bay. Our specimens are from Chame Point; Taboga Island; and tide pools, Balboa.

267. Caranx ruber (Bloch).

Scomber ruber Bloch, Naturg. Ausl. Fische, VII, 1793, 75, Pl. CCCXLII (Ste. Croix).

Caranx ruber Bloch & Schneider, Syst. Ichth., 1801, 29; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 919.

Caranx blochii Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 69 (Ste. Croix); Günther, Cat. Fish. Brit. Mus., II, 1860, 430.

Caranx iridinus Poey, Memorias, II, 1860, 226 (Cuba).

Carangoides iridinus Poey, Syn. Pisc. Cub., 1868, 366.

Head 3.4 to 3.65; depth 2.9 to 3.26; D. VIII-I, 27 or 28; A. II-I, 23 or 24; lateral scutes about 30 to 35.

Body elongate, compressed; the upper profile evenly convex, slightly carinate anteriorly; the lower outline only slightly curved in front of anal; head long and tapering; snout long, 2.9 to 3.05 in head; eye 3.64 to 4.3; mouth slightly oblique; jaws subequal; maxillary reaching anterior margin of eye, 2.55 to 2.8 in head; teeth small, present on both jaws, vomer, palatines and tongue; preopercle with a rather smooth membranous border; gill-rakers long and slender, 30 to 32, besides rudiments, on lower limb of first arch; scales small, cycloid; breast fully scaled; cheeks and postorbital region scaly, rest of head mostly without scales; lateral line with a low arch which is nearly as long as the straight portion; lateral scutes rather weak; first dorsal composed of slender spines; second dorsal and anal only slightly elevated anteriorly, each with a low sheath of scales at base, the fins entirely covered with scales; ventrals reaching vent; pectorals long and falcate in adult, proportionately shorter in young, 3.35 to 3.4 in length of body.

Color mostly bluish above, silvery below; dorsal and anal dusky; lower lobe of caudal with a dusky bar.

This species was not taken by us. It is recorded from North Carolina, the Bahama Islands and southward to Cozumel. It is here described from specimens from Nassau and Havana, ranging in length from 220 to 300 mm.

268. Caranx vinctus Jordan & Gilbert.

Caranx vinctus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 349 (Mazatlan); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 918; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 77.

Head 3.4 to 3.75; depth 2.6 to 3.0; D. VII or VIII-I, 22 to 24; A. II-I, 19 to 21; lateral scutes 44 to 50.

Body elongate, compressed; the upper profile evenly convex, slightly carinate in front of spinous dorsal; lower outline anteriorly only slightly convex; head rather long, tapering; snout 2.8 to 3.5 in head; eye 3.9 to 4.4; mouth slightly oblique; jaws subequal; maxillary reaching slightly past anterior margin of eye, 2.75 to 2.9 in head; teeth on premaxillary and mandible small, in a narrow band, becoming a single series laterally on mandible, similar teeth on vomer, palatines and tongue; preopercle with a nearly smooth membranous border; gill-rakers long, 24 to 26, besides rudiments, on lower limb of first arch; scales small, cycloid; breast entirely scaled; cheeks scaly, rest of head mostly scaleless; lateral line with a strong arch anteriorly, notably shorter than the straight portion; lateral scutes strong; first dorsal with slender spines, the first very short, disappearing with age; second dorsal and anal scarcely elevated anteriorly, each long and low with a very wide sheath of scales at base; no scales on fins; ventrals reaching to or slightly past vent; pectorals in adult very long and falcate, 2.85 to 3.1 in length of body.

Color bluish or brown above, silvery below; sides with 8 or 9 dark bars, extending from back to below lateral line; head mostly dusky; opercle with a distinct black spot; dorsal and anal with more or less dusky, other fins mostly pale.

Of this species only 2 specimens, ranging from 265 to 355 mm. in length, were taken. We have had for comparison the type and 3 other large specimens from Mazatlan.

Known from the Gulf of California to Panama. Our specimens were bought in the Panama City market.

269. Caranx crysos (Mitchill). (Plate XXVII.)

Scomber crysos Mitchill, Trans. Lit. & Phil. Soc. N. Y., I, 1815, 424 (New York).

Caranx pisquetus Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 97 (San Domingo, Cuba, and Brazil).

Caranx crysos DeKay, Fauna N. Y., Fishes, 1842, 121, Pl. XXVII, fig. 85; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 921, Pl. CXLII, fig. 388; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 401 (Colon), and 1917, 131 (Colon).

Trachurus squamosus Gronow, Cat. Fish, 1854, 125 (Carolina).
Paratractus pisquetus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 432.
Caranx chrysus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1883, 199.

Head 3.3 to 3.7; depth 2.8 to 3.0; D. VIII-I, 23 to 25; A. II-I, 19 to 20; lateral scutes 40 to 50.

Body elongate, rather slender, compressed; dorsal and ventral outlines about evenly rounded, the dorsal carinate anteriorly; head rather short; snout blunt, 3.25 to 3.75 in head; eye 3.2 to 4.1; mouth oblique; jaws subequal; maxillary reaching about middle of eye, 2.3 to 2.5 in head; teeth present on both jaws, vomer, palatines and tongue, some of the outer teeth in jaws slightly enlarged; preopercle with a slightly serrate membranous border; gill-rakers rather long and slender, 24 or 25, exclusive of rudiments, on lower limb of first arch; scales small, cycloid; breast completely scaled; cheeks and postorbital region mostly scaled, rest of head without scales; lateral line with a prominent arch anteriorly, which is usually only about two-thirds the length of the straight portion; lateral scutes strong posteriorly, forming a prominent keel on caudal peduncle; first dorsal with slender spines; second dorsal and anal only slightly elevated anteriorly, very low posteriorly, each with a wide sheath of scales at base, the fins themselves covered with small scales, at least anteriorly; ventrals not quite reaching vent in adult, reaching to or past vent in young; pectorals long and falcate in adult, proportionately shorter in young, 3.0 to 3.6 in length of body.

Color bluish above, silvery below; a black opercular spot present; spinous dorsal and margin of dorsal and caudal dusky; other fins mostly pale.

Of this species only 6 specimens, ranging from 130 to 165 mm. in length, were obtained.

Known from Cape Cod to Brazil. Our specimens are from Fox Bay, Colon, and Colon market.

270. Caranx caballus Günther. (Plate XXVIII.)

Trachurus boops Girard (House of Repr. Ex. Doc. No. 91) Rept. Expl. & Surv. Miss. R. to Pac. O., X, Pt. IV, 1858, 108 (San Diego; not *Caranx boops* Cuvier & Valenciennes).

Caranx boops Gill, Proc. Ac. Nat. Sci. Phila., 1862, 261.

Caranx caballus Günther, Trans. Zoöl. Soc. London, VI, 1869, 431 (Panama); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 78; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 99; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 409 (Panama).

Caranx girardi Steindachner, (Sitzb. k. Ak. Wiss. Wein., LX) Ichth. Notizen, IX, 1869, 25 (San Diego).

Head 3.4 to 3.7; depth 3.1 to 3.5; D. VIII-I, 23 or 24; A. II-I, 19 to 21; lateral scutes 38 to 52.

Body elongate, rather fusiform, not as strongly compressed as in related species; dorsal and ventral outlines about evenly rounded, the dorsal outline slightly carinate anteriorly only in young; head moderate; snout blunt, 3.5 to 4.05 in head; eye 3.2 to 4.3; mouth oblique; jaws subequal; maxillary not quite reaching middle of eye, 2.6 to 2.75 in head; teeth present on both jaws, vomer, palatines and tongue, some of the outer ones on upper jaw slightly enlarged; preopercle with an almost smooth membranous border; gill-rakers slender, 27 to 29, exclusive of rudiments, on lower limb of first arch; scales small, cycloid; breast fully scaled; cheeks and postorbital regions scaled, the rest of head scaleless; lateral line with a prominent arch anteriorly, which is usually only slightly more than half as long as the straight portion; lateral scutes moderate; first dorsal with slender spines; second dorsal and anal only slightly elevated anteriorly, very low posteriorly, each with a low scaly sheath at base, the elevated portion of fins covered with small scales; the ventrals not reaching vent except in young; pectorals very long and falcate in adult, proportionately much shorter in young, 2.63 to 4.25 in length of body.

Color bluish gray above, silvery below; head mostly dusky; a black opercular spot present; dorsals and caudal dusky; other fins usually mostly pale.

Ten specimens, ranging from 205 to 355 mm. in length, were secured. This species is very closely related to *C. crysos*, from which it, however, may be distinguished by the less compressed and shallower body, slightly smaller mouth, and the more numerous gill-rakers.

Known from San Diego to Peru. Our specimens are from Panama Bay, Balboa, and the Panama City market.

105. Genus **Gnathanodon** Bleeker.

Gnathanodon Bleeker, Nat. Tijds. Ned.—Ind., I, 1851, 160 (type *Scomber speciosus* Forskål).

Hypocaranx Klunzinger, Fische des Rothen Meeres, 1884, 92 (type *Scomber speciosus* Bloch).

This genus differs from *Caranx* chiefly in the dentition. Teeth very small, present only on the jaws and tongue; those on jaws entirely lost with age.

271. Gnathanodon speciosus (Forskål).

Scomber speciosus Forskål, Descr. Animal., 1775, 54 (Red Sea).
Scomber rim Forskål, Descr. Animal., 1775, 54 (Djidda, Arabia).
Caranx poloosoo Richardson, Voy. Erebus & Terror, Ichth., 1844, Pl. LVIII, figs. 4 and 5; called *Caranx speciosus* in text (Australia).
Gnathanodon speciosus Bleeker, Verh. Bat. Gen., XXIV, Makreele, 1852, 6, 12; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 928; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 79.
Caranx speciosus Günther, Cat. Fish. Brit. Mus., II, 1860, 444, and Trans. Zoöl. Soc. London, VI, 1869, 431.
Caranx panamensis Gill, Proc. Ac. Nat. Sci. Phila., 1863, 166 (Panama).

Head 3.0 to 3.25; depth 2.15 to 2.32; D. VII-I, 19 or 20; A. II-I, 15 or 16; lateral scutes weak, about 12 to 15.

Body deep, strongly compressed; dorsal profile very strongly convex; lower outline gently curved; head rather short; snout blunt, 2.4 to 2.65 in head; eye 4.3 to 5.4; mouth slightly oblique; jaws subequal, the lower slightly included; maxillary reaching to or slightly past anterior margin of eye, 2.4 to 2.5 in head; teeth minute, present on jaws and tongue, those on jaws disappearing entirely with age; preopercle with a practically smooth membranous edge; gill-rakers rather short, 18 or 19, exclusive of rudiments, on lower limb of first arch; scales small, cycloid; breast scaled; cheeks and postorbital regions mostly with scales, the rest of head scaleless; lateral line with a low arch, which is nearly as long as the straight portion; lateral scutes few and very weak, not forming an evident keel on caudal peduncle; first dorsal with only 7 spines; second dorsal and anal not greatly elevated anteriorly, each with a narrow sheath of scales at base of first half of fin, the fins without scales; pectorals long and falcate in adult, proportionately shorter in young, 2.5 to 3.2 in length of body.

Color brownish green above; below golden in life, mostly pale in spirits; sides with about 6 broad dusky cross-bars; a narrow stripe between each pair of bands; opercular spot obsolete; fins mostly yellowish green in life; axil of pectoral black.

Only 3 specimens, ranging from 225 to 500 mm. in length, were taken.

Known from the tropical parts of the Pacific and Indian oceans. Our specimens are from Panama Bay, Balboa, and Panama City market.

106. Genus **Citula** Cuvier.

Citula Cuvier, Règne Animal, Ed. I, 1817, 315 (type *Sciæna armata* Forskål).

Body deep, compressed, elongate in adult, more or less ovate in young, but never as much so as in *Alectis;* head rather short, not much, if any, deeper than long, its anterior profile not very steep, rather gently and evenly convex; snout blunt, well in advance of forehead; teeth minute, in bands on jaws, vomer, palatines and tongue; scales small, but larger than *Alectis;* lateral line with rather large bony scutes on its straight portion; first dorsal with 6 spines, the posterior ones very short, becoming obsolete with age; second dorsal and anal similar, the first ray of each fin with a filament, which is proportionately longer in young than in adult, but never reaches the extreme proportions of *Alectis;* spines preceding anal short, becoming obsolete with age; ventral fins proportionately much longer in young than in adult.

272. Citula dorsalis (Gill).

Carangoides dorsalis Gill, Proc. Ac. Nat. Sci. Phila., 1863, 166 (Panama).

Caranx dorsalis Günther, Trans. Zoöl. Soc. London, VI, 1869, 432; Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 375; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 79.

Caranx otrynter Jordan & Gilbert, Proc. U. S. Nat. Mus., 1883, 202 (a new name as a substitute for *dorsalis;* preoccupied in *Caranx,* if *Vomer dorsalis* is regarded as a species of *Caranx*).

Head 3.0 to 3.35; depth 1.57 to 2-1; D. VI-I, 18 or 19; A. II-I, 16 or 17.

Body deep, elongate in adult, more or less ovate in young, rather strongly compressed; the back moderately elevated; anterior profile about evenly convex; outlines of body with a very broad angle at origin of second dorsal and anal; head rather short, but not much deeper, if any, than long; eye moderate; snout blunt, well in advance of forehead, 2.42 to 3.2 in head; eye 3.46 to 4.45; mouth rather large, oblique; jaws subequal; maxillary broad, usually not quite reaching middle of eye, 2.13 to 2.5 in head; teeth minute, in bands on jaws, vomer, palatines and tongue; gill-rakers short and rather strong, 15 to 17 on lower limb of first arch; scales small; breast fully scaled; cheeks and postorbital regions mostly scaly, the rest of head naked; lateral line with a rather long and low arch, the straight portion armed with bony scutes, which form a keel on caudal peduncle; first dorsal with short spines, the posterior ones becoming obsolete with age; second dorsal and anal similar, much elevated anteriorly, the first ray of each fin bearing a filament, which in young reaches past tip of caudal; caudal deeply forked, the lobes of equal length; ventrals nearly as long

as head in our smallest specimens, shorter than snout in adult; pectorals long and falcate, 2.3 to 2.55 in length of body.

Color bluish or yellowish above; sides mostly yellowish or silvery, with narrow, pale cross-bars in young; edge of opercle above posterior angle black; young with a black bar extending from posterior angle of mouth through eye to origin of spinous dorsal; fins mostly pale in adult; the produced portions of dorsal and anal, and the ventrals black in our smallest specimens.

Only 5 specimens of this species, ranging from 145 to 300 mm. in length, were obtained. Besides these we have examined 2 specimens, 220 and 480 mm. long, from Mazatlan. The above description is based on all material examined. It is regretted that there are no smaller specimens available for study, as in species of related genera the most marked variation, due to age, was noted among small specimens.

Known from the Pacific coast of Central America, from Mazatlan to Panama. Our specimens are from Balboa and Panama City market.

107. Genus **Alectis** Rafinesque.

Gallus Lacépède, Hist. Nat. Poiss., IV, 1803, 583 (type *Gallus virescens* Lacépède=*Zeus gallus* Linnæus; name preoccupied).

Alectis Rafinesque, Analyse Nat., etc., 1815, 84 (substitute for *Gallus,* preoccupied).

Blepharis Cuvier, Règne Animal, Ed. I, II, 1817, 322 (type *Zeus ciliaris* Bloch, name preoccupied).

Scyris Cuvier, Règne Animal, Ed. II, II, 1829, 209 (type *Scyris indica* Cuvier & Valenciennes).

Gallichtys Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 168 (type *Gallichtys major* Cuvier & Valenciennes; substitute for *Gallus,* preoccupied).

Blepharichthys Gill, Proc. Ac. Nat. Sci. Phila., 1861, 36 (type *Zeus crinitus* Mitchill; substitute for *Blepharis,* preoccupied).

Body strongly ovate in young, becoming much more elongate in adult, compressed; the back much elevated, at least in young; head short and deep, its anterior profile convex; mouth rather large; the maxillary reaching well past anterior margin of eye; teeth small, in bands on jaws, vomer, palatines and tongue; scales minute, embedded; lateral line with bony scutes on its straight portion; first dorsal with 6 or 7 short spines, becoming obsolete with age; second dorsal and anal similar, the anterior rays of each fin bearing filaments, which in young reach several times the length of body, much shorter in adult; spines preceding anal very short, becoming obsolete with age; ventral fins

very long in young, becoming much shorter with age. The changes due to age in this genus are remarkably great.

273. Alectis ciliaris (Bloch).

Zeus ciliaris Bloch, Naturg. Ausl. Fische, III, 1787, 36, Pl. CXCI (East Indies; Suratte).

Scomber filamentosus Mungo Park, Trans. Linn. Soc., III, 1797, 36 (Sumatra).

Gallus virescens Lacépède, Hist. Nat. Poiss., IV, 1803, 583 (after Linnæus).

Zeus crinitus Mitchill, Amer. Journ. Sci. & Arts, XI, 1826, 144 (Shoreham).

Blepharis sutor Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 161, Pl. CCLIII (Caribbean Sea).

Gallichtys major Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 168, Pl. CCLIV (West Indies).

Gallichtys chevola Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833. 175 (East Indies).

Blepharis crinitus De Kay, Fauna N. Y., Fishes, 1842, 123; Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 438.

Carangoides blepharis Bleeker, Verh. Bat. Gen., XXIV, 1852, 67 (East Indies).

Carangoides gallichthys Bleeker, Verh. Bat. Gen., XXIV, 1852, 68 (East Indies).

Caranx sutor Günther, Cat. Fish. Brit. Mus., II, 1860, 454.

Blepharichthys crinitus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 262.

Scyris analis Poey, Syn. Pisc. Cub., 1868, 369 (Cuba).

Gallichthys crinitus Lütken, (Dan. Vid. Selsk. Skr., 5 ser., XII) Spolia Atlantica, 1880, 131, 197.

Caranx crinitus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 359.

Alectis ciliaris Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 931; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 80.

Head 2.75 to 3.25; depth 1.02 to 2.0; D. VI-I, 18 to 20; A. II-I, 15 to 17.

Body ovate, nearly as deep as long in young, becoming much more elongate in adult; anterior profile rather steep, convex; outlines strongly angulated at origin of second dorsal and anal in young, these angles becoming much more obtuse with age; head short and deep; eye large, 2.55 to 3.7 in head; snout little projecting, 2.55 to 4.6 in head; mouth rather large, oblique; jaws subequal; maxillary broad, reaching nearly to below middle of eye, 2.15 to 2.7 in head; teeth small, in bands on jaws, vomer and palatines; upper surface of tongue almost wholly cov-

ered with villiform teeth; gill-rakers rather short, 13 to 15 on lower limb of first arch; scales minute, embedded; lateral line with a prominent arch, the straight portion armed with bony scutes posteriorly; first dorsal very low, some of the spines becoming obsolete with age; second dorsal and anal similar, the anterior rays of each fin produced into filaments, which are many times the length of body in young, proportionately much shorter in adult; caudal broadly forked, the lobes subequal; ventrals in very young nearly as long as body, less than half the length of head in adult; pectorals long and falcate in adult, proportionately much shorter in young, 2.13 to 4.1 in length of body.

Color bluish above; sides silvery, with traces of darker bars or blotches in young; opercle often with a dark blotch; a black bar extending from posterior angles of mouth through eye to base of first dorsal present in young; ventrals and the produced portions of dorsal and anal bluish or blackish, the other fins mostly pale; the filaments with pale spots in very small specimens.

Of this species we have 15 small specimens, ranging from 15 to 70 mm. in length. Two specimens are from the Atlantic coast and the others are from the Pacific. We have examined specimens from Virginia, Florida, Hawaii and New South Wales. We are unable to detect any differences. The above description is based on all the material examined. The largest specimen at hand is from Key West, Florida, and is 560 mm. long. It varies very remarkably from the young in the much more elongated body, the anterior profile is not as steep, the outlines of body are scarcely angulate at origin of second dorsal and anal, the pectorals are very long and falcate and the filaments do not reach past tip of caudal.

Known from both coasts of tropical America. Our Atlantic specimens are from Fox Bay, Colon, and the Pacific specimens are from Chame Point and the Panama City market.

108. Genus **Vomer** Cuvier.

Vomer Cuvier, Règne Animal, Ed. I, II, 1817, 316 (type *Vomer brownii* Cuvier).

Body broad, ovate, very strongly compressed; the outlines trenchant; head short and deep, its anterior profile nearly vertical; snout only slightly projecting; teeth small, present on both jaws, vomer and tongue; palatines with few weak teeth or none; scales small, rudimentary; lateral line strongly arched, its straight portion with weak bony scutes posteriorly; soft dorsal and anal very low, never falcate. Other characters essentially as in *Caranx*.

KEY TO THE SPECIES.

a. Body very deep, the anterior profile vertical, depth in length 1.7 to 1.8 in specimens about 200 mm. long; gill-rakers 24 to 27, besides one or two rudiments, on the lower limb of first arch. *setapinnis*, p. 366.

aa. Body scarcely as deep, the anterior profile not quite vertical, depth in length 1.85 to 1.95 in specimens about 200 mm. long; gill-rakers 28 to 32, besides one or two rudiments, on the lower limb of first arch . *declivifrons* sp. nov., p. 367.

274. Vomer setapinnis (Mitchill). (Plate XXIX, fig. 1.)

Zeus setapinnis Mitchill, Trans. Lit. & Phil. Soc. N. Y., I, 1815, 384 (New York).

Vomer brownii Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 189, Pl. CCLVI (New York).

Platysomus micropteryx Swainson, Nat. Hist. & Class. Fish., II, 1839, 406 (Pernambuco).

Argyreiosus unimaculatus Batchelder, Proc. Bost. Soc. Nat. Hist., II, 1845, 78 (Maine; young).

Argyreiosus setipinnis Günther, Cat. Fish. Brit. Mus., II, 1860, 459 (part).

Vomer setipinnis Gill, Proc. Ac. Nat. Sci. Phila., 1862, 436; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 934, Pl. CXLIV, fig. 392 (part).

Vomer sanctæ-marthæ, columbianus, martinicensis, dominicensis, noveboracensis sanctæ-petri, brasiliensis, cayennensis, and *cubæ* Guichenot, Ann. Soc. Linn. Maine et Loire, VIII, 1865, 38 to 44 (localities indicated by the names).

Vomer curtus Cope, Proc. Ac. Nat. Sci. Phila., 1870, 119 (Rhode Island; young).

Selene setipinnis Lütken, (Dan. Vid. Selsk. Skr., 5 ser., XII) Spolia Atlantica, 1880, 135.

Caranx setipinnis Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 595.

Vomer setapinnis Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 401 (Colon), and 1917, 132 (Colon).

Head 2.5 to 3.3; depth 1.3 to 1.95; D. VIII-I, 21 to 23; A. II-I, 17 to 19.

Body rhombic, very strongly compressed, usually proportionately deeper in young than in adult, depth in length 1.7 to 1.8 in specimens about 200 mm. in length; back much elevated; anterior profile very steep, slightly concave in front of eyes; the ventral profile slightly

more convex than the dorsal; head short and deep; snout little projecting, 2 to 2.4 in head; eye 3.75 to 4.55; mouth large, oblique; lower jaw slightly in advance of the upper; maxillary broad, failing to reach vertical from anterior margin of eye in young, reaching anterior margin of pupil in adult, 2.5 to 2.9 in head; teeth small, those in jaws in a single irregular series or in a narrow band; vomerine teeth in a rather large triangular patch, with a backward projection; palatines toothless; tongue with a rather large band of villiform teeth; gill-rakers about two-thirds the length of eye, 24 to 27, besides one or two rudiments, on lower limb of first arch; scales very small, rudimentary; lateral line with a prominent arch, which is about as long as head in adult, shorter in young, the straight portion posteriorly armed with small bony scutes; first dorsal with 8 spines, the anterior 4 or 5 connected by membrane, the others very short and far apart; second dorsal and anal similar, very low, not notably elevated anteriorly; caudal broadly forked, the lobes of equal length; ventrals very small, only about half as long as eyes; pectorals long and falcate, 2.55 to 3.55 in length of body.

Color sky blue above, sides silvery; opercle with a blue blotch and usually with a small black spot above its posterior angle; a broad indistinct bluish band extending from snout through eye to opercle sometimes present; tip of lower jaw black; fins mostly pale; dorsal and caudal often with more or less dusky.

We have 17 specimens of this species, ranging from 60 to 185 mm. in length. Besides these we have examined numerous specimens from the Atlantic coast of the United States, Jamaica and Brazil.

Known from Halifax to Uruguay. Also recorded from Kamerun, West Africa. Our specimens are from Toro Point; Mindi Cut; Mindi Reef; Fox Bay, Colon; Colon market, and Porto Bello.

275. Vomer declivifrons sp. nov. (Plate XXIX, fig. 2.)

Argyreiosus setipinnis Günther, Cat. Fish. Brit. Mus., II, 1860, 459 (part, not of Mitchill).

Caranx setipinnis Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 625 (not of Mitchill).

Selene setipinnis Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 440 (part, not of Mitchill).

Vomer setipinnis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 934 (part, not of Mitchill); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 80 (not of Mitchill); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 100 (not of Mitchill).

Argyriosus setipinnis Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 3 (not of Mitchill).

Vomer setapinnis Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 409 (Panama; not of Mitchill).

Type No. 81773, U. S. N. M.; length 200 mm.; Panama City, Panama.

Head 2.8 to 3.2; depth 1.5 to 2.1; D. VIII-I, 21 to 24; A. II-I, 17 to 19.

Body rhombic, very strongly compressed, proportionately deeper in young than in adult, scarcely as deep as in *V. setapinnis,* depth in length 1.85 to 1.95 in specimens about 200 mm. long; the back much elevated; the anterior profile scarcely as steep as in *V. setapinnis,* slightly concave in front of eyes; the ventral outline more convex than the dorsal; head rather short and deep; snout slightly projecting, 2.1 to 2.45 in head; eye 3.4 to 4.35; mouth large, oblique; lower jaw slightly in advance of the upper; maxillary broad, reaching anterior margin of eye in adult, shorter in young, 2.4 to 2.85 in head; teeth small, those in jaws in single, irregular series or in a narrow band; vomerine teeth in a triangular patch with a backward extension; palatines toothless; tongue with a large band of villiform teeth; gill-rakers about three-fourths the length of eye, 28 to 32, besides one or two rudiments, on the lower limb of first arch; scales very small, rudimentary; lateral line with a prominent arch anteriorly, which is about as long as head in adult, shorter in young, the straight portion posteriorly armed with bony scutes; first dorsal with eight spines, anterior 4 or 5 connected by membrane, the others short and far apart; second dorsal and anal similar, very low, not notably elevated anteriorly; caudal broadly forked, the lobes of about equal length; ventrals very small, shorter than eye; pectorals long and falcate, 2.5 to 3.0 in length of body.

Color bluish above, sides silvery; opercle with a bluish area and often a small black spot above its posterior angle; a broad, indistinct, bluish band extending from snout through eye to upper angle of opercle sometimes present; tip of lower jaw black; fins mostly pale, the dorsal and caudal often with more or less dusky.

We have 43 specimens, ranging from 45 to 235 mm. in length. This species differs from *V. setapinnis* in the more numerous gill-rakers, and in the slightly more elongate body. The latter difference, however, is noticeable only when specimens of equal size are compared. The snout projects slightly more, and the anterior profile is scarcely as steep.

Ranging from Cape San Lucas to Peru. Our specimens are from Chame Point, Balboa and Panama City market.

109. Genus **Chloroscombrus** Girard.

Chloroscombrus Girard, Proc. Ac. Nat. Sci. Phila., 1859, 168 (type *Seriola cosmopolita* Cuvier & Valenciennes=*Scomber chrysurus* Linnæus).

Body ovate, strongly compressed; the ventral outline much more strongly curved than the dorsal, both carinate; head short; mouth very strongly oblique; lower jaw slightly projecting; upper jaw protractile; maxillary broad, emarginate behind, with a large supplemental bone; teeth very small, present on both jaws, vomer, palatines and tongue; gill-rakers long and slender; head mostly naked, rest of body covered with small smooth scales; lateral line with a strong arch anteriorly, with or without a few small bony scutes; first dorsal with feeble spines, connected by membrane; second dorsal and anal long and low, longer than the short abdomen; no finlets; caudal fin deeply forked; ventrals small; pectorals long and falcate.

KEY TO THE SPECIES.

a. Body very deep, with extremely convex abdomen, its depth 2.1 to 2.4 in its length; bony scutes in lateral line wholly obsolete; color rather light, bluish gray above. *chrysurus*, p. 369.

aa. Body scarcely as deep, with less strongly convex abdomen, its depth 2.45 to 2.8 in its length; lateral line posteriorly armed with small bony scutes; color dark, bluish black above. *orqueta*, p. 370.

276. Chloroscombrus chrysurus (Linnæus). (Plate XXX, fig. 1.)

Scomber chrysurus Linnæus, Syst. Nat., Ed. XII, 1766, 494 (Charleston, S. C.).

Scomber chloris Bloch, Naturg. Ausl. Fische, VII, 1793, 67, Pl. CCCXXXIX (Acara).

Micropteryx cosmopolita Agassiz, in Spix, Pisc. Brasil., 1831 104 (Brazil).

Seriola cosmopolita Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 219, Pl. CCLIX.

Scomber latus Gronow, Cat. Fish., 1854, 127 (Carolina).

Chloroscombrus caribbæus Girard, U. S. & Mex. Bound. Surv., II, Pt. II, Fishes, 1859, 21, Pl. XI, fig. 6 (St. Josephs Island, Texas).

Micropteryx chrysurus Günther, Cat. Fish. Brit. Mus., II, 1860, 460.

Chloroscombrus chrysurus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 437; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 938,

Pl. CXLV, fig 394; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 402 (Colon), and 1917, 132 (Colon).

Head 3.6 to 4.3; depth 2.1 to 2.4; D. VIII-I, 26 or 27; A. II-I, 26 to 28.

Body ovate, very strongly compressed; dorsal and ventral outlines regularly curved, the latter very convex, much more strongly curved than the former, each carinate anteriorly; head short and deep; snout blunt, shorter than eye, 3.34 to 4 in head; eye 2.66 to 3.2; mouth nearly vertical; lower jaw projecting; maxillary reaching anterior margin of eye, 2.45 to 2.74 in head; teeth very small, those on jaws in very narrow bands or single series; those on vomer, palatines and tongue in villiform patches or bands; gill-rakers slender, close set, about two-thirds length of eye, 28 to 33 on lower limb of first arch; head, dorsal and ventral ridges naked, the rest of body with small cycloid scales; lateral line with a prominent arch anteriorly, longer than head, contained 3.2 to 3.9 times in length of body, the straight portion without bony scutes; first dorsal with slender spines; second dorsal and anal of about equal length, the former more strongly elevated anteriorly than the latter, each with a sheath of scales at base; pectorals long and falcate in adult, proportionately much shorter in young, 2.9 to 3.6 in length of body.

Color bluish gray above, sides silvery; a small opercular spot present; a prominent black, quadrate blotch on upper half of base of caudal; fins yellowish in life; vertical fins edged with black; pectorals and ventrals pale in spirits.

This species is represented by 84 specimens, ranging from 40 to 200 mm. in length.

Known from Cape Cod to Brazil. Our specimens are from Toro Point; Mindi Cut; Fox Bay, Colon, and Colon market.

277. Chloroscombrus orqueta Jordan & Gilbert. (Plate XXX, fig. 2.)

Chloroscombrus orqueta Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 646 (Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 937; Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 3; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 82; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 100.

Chloroscombrus stirurus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1883, 206.

Head 3.5 to 4.43; depth 2.45 to 2.8; D. VIII-I, 26 to 28; A. II-I, 26 to 28.

Body ovate, very strongly compressed; dorsal and ventral outlines regularly curved, the latter much more strongly convex than the former, each carinate anteriorly; head short and deep; snout blunt, shorter than eye, 3.6 to 4.35 in head; eye 2.6 to 3.15; mouth nearly vertical; lower jaw projecting; maxillary reaching anterior margin of eye, 2.4 to 2.8 in head; teeth very small, those on jaws forming very narrow bands or single series, those on vomer, palatines, and tongue in villiform patches and bands; gill-rakers very slender, close set, slightly more than half as long as eye. 30 to 35 on the lower limb of first arch; head, dorsal and ventral ridges naked, the rest of the body covered with small cycloid scales; lateral line with a prominent arch, which is longer than head, and is contained 2.94 to 3.5 times in length of body, the straight portion posteriorly armed with small bony scutes; first dorsal with slender spines; second dorsal and anal of about equal length, the former anteriorly more strongly elevated than the latter, each with a sheath of scales at base; pectorals long and falcate in adult, proportionately much shorter in young, 2.7 to 4.1 in length of body.

Color bluish black above, sides silvery; a very distinct opercular spot present; a quadrate blotch on upper half of base of caudal; fins yellowish in life, dorsal and anal edged with black and caudal with more or less dusky.

We have 48 specimens of this species, ranging from 20 to 190 mm. in length. The two species of this genus are rather closely related, but in our large series the Pacific coast specimens, while varying considerably among themselves, are constantly a little more slender than the Atlantic ones. The lateral line on caudal peduncle is armed with small bony scutes, which are wholly obsolete in Atlantic specimens. The Pacific specimens are also constantly darker in color.

Known from Magdalena Bay and Panama. Our specimens are from Chame Point, tide pools and Panama Bay at Balboa, and the Panama City market.

110. Genus **Selene** Lacépède.

Selene Lacépède, Hist. Nat. Poiss., IV, 1803, 560 (type *Selene argentea* Lacépède=*Zeus vomer* Linnæus).

Argyreiosus Lacépède, Hist. Nat. Poiss., IV, 1803, 566 (type *Zeus vomer* Linnæus).

Body ovate, very closely compressed; the back much elevated; anterior profile very steep but never vertical, forming a rather abrupt

angle with dorsal outline at occipital region; edges of body everywhere trenchant; head short and deep; opercles very short; preorbital extremely deep; mouth moderate; premaxillaries protractile, fitting into a notch between the bases of the maxillaries; maxillaries broad, each with a supplemental bone; teeth small, present on jaws, vomer, and tongue; palatines with a few very minute teeth or none; lateral line with a prominent arch, entirely unarmed; spines of first dorsal slender, filamentous in young; free anal spines immovable, obsolete in adult; second dorsal and anal much elevated anteriorly in adult, the first ray of each fin much produced, these fins little elevated anteriorly and without produced rays in very young individuals.

KEY TO THE SPECIES.

a. Body extremely closely compressed, the outlines anteriorly sharply trenchant; occipital region with an abrupt angle; D. VIII-I, 21 to 23; A. II-I, 17 to 20; gill-rakers long and slender, 23 or more on lower limb of first arch.

b. Body very deep, the depth 1.33 to 1.45 in length, in specimens about 200 mm. long; gill-rakers in moderate number, 23 to 26, besides one or two rudiments, on lower limb of first arch.
vomer, p. 372.

bb. Body scarcely as deep, the depth 1.53 to 1.6 in length, in specimens about 200 mm. long; gill-rakers numerous, 28 to 32, besides one or two rudiments, on lower limb of first arch.
brevoortii, p. 374.

aa. Body less closely compressed, the outlines anteriorly not coming to a sharp edge; occipital region without a very abrupt angle; D. VIII-I, 16 to 18; A. II-I, 15 or 16; gill-rakers rather short and strong, 13 to 16, besides one or two rudiments, on lower limb of first arch. *ærstedii*, p. 375.

278. Selene vomer (Linnæus). (Plate XXXI.)

Zeus vomer Linnæus, Syst. Nat., Ed. X, 1758, 266 (America).

Zeus gallus Linnæus, Syst. Nat., Ed. X, 1758, 267 (America).

Zeus niger Bloch & Schneider, Syst. Ichth., 1801, 98 (confounded with *Pomacanthus arcuatus*).

Selene argentea Lacépède, Hist. Nat. Poiss., IV, 1803, 560, Pl. IX, fig. 2 (adult); Gill, Proc. Ac. Nat. Sci. Phila., 1862, 436.

Argyreiosus vomer Lacépède, Hist. Nat. Poiss., IV, 1803, 566.

Zeus capillaris Mitchill, Trans. Lit. & Phil. Soc. N. Y., I, 1815, 383 (New York; young).

Zeus rostratus Mitchill, Trans. Lit. & Phil. Soc. N. Y., I, 1815, 384 (New York; young).

Zeus geometricus Mitchill, Amer. Monthly Mag., II, 1818, 245 (New York; adult).

Argyriosus triacanthus Swainson, Nat. Hist. & Class. Fish., II, 1839, 250 (Brazil; after Spix & Agassiz, Pl. LVIII).

Argyriosus filamentosus Swainson, Nat. Hist. & Class. Fish., II, 1839, 250 (after Cuvier & Valenciennes, Pl. CCLV).

Argyriosus mauriceii Swainson, Nat. Hist. & Class. Fish., II, 1839, 408 (Brazil; adult).

Argyriosus setifer Swainson, Nat. Hist. & Class. Fish., II, 1839, 407 (after Cuvier & Valenciennes, Pl. CCLV).

Argyreiosus mitchilli De Kay, Fauna N. Y., Fishes, 1842, 126 (New York; young).

Argyreiosus spixii Castelnau, Anim. Nouv. Rares Amér. Sud, 1855, 23 (Brazil; adult).

Argyriosus vomer Gill, Proc. Ac. Nat. Sci. Phila., 1862, 437.

Argyriosus capillaris Gill, Proc. Ac. Nat. Sci. Phila., 1862, 437.

Selene vomer Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 439 (part); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 936, Pl. CXLIV, fig. 393 and Pl. CXLV, fig. 393a.

Head 2.25 to 2.7; depth 1.28 to 1.45; D. VIII-I, 21 to 23; A. II-I, 18 to 20.

Body ovate, very strongly compressed, the outlines strongly trenchant, very deep, the depth 1.33 to 1.45 in length in specimens about 200 mm. long; back much elevated; anterior profile ascending at a steep angle, straight or slightly concave, forming an angle at occipital region; ventral outline anteriorly gently convex, angulated at origin of anal; head short and very deep; snout little projecting, 1.67 to 2.2 in head; eye 4 to 5.25; mouth moderate, oblique; lower jaw in advance of upper; maxillary broad, failing to reach vertical from anterior margin of eye, 2.7 to 3.4 in head; teeth small, those on upper jaw in a band, those on lower jaw mostly in a single series; vomerine teeth in a triangular patch; palatines with a few weak teeth or none; tongue with a band of villiform teeth; gill-rakers slender, rather close set, about two-thirds as long as eye, 23 to 26, besides one or two rudiments, on lower limb of arch; scales very small, rudimentary; lateral line with a prominent arch, which is usually somewhat shorter than head, the straight portion unarmed, an accessory branch present, extending from scapula to below base of spinous dorsal; first dorsal with 8 spines, the second, third and fourth bearing filaments which

are more than twice the length of the body in young, the longest spine about the length of eye in adult; second dorsal and anal similar, falcate, the anterior rays much produced, the first one on each fin filamentous in adult, these fins lower in young and without filaments; caudal deeply forked, the lobes subequal; ventrals very small in adult, shorter than eye, in young they are filamentous, more than half as long as the body; pectorals long and falcate in adult, proportionately much shorter in young, 2.2 to 3.75 in length of body.

Color bluish green above, sides silvery; very young with an oblique bar extending from snout through eye to origin of first dorsal; sides with indistinct vertical bars or dusky blotches; fins mostly pale, dorsal and caudal with dusky in adult; filaments of fins in young bluish black.

Of this species 25 specimens, ranging from 30 to 210 mm. in length, were taken. We have also examined specimens from Massachusetts, Virginia, Florida and Brazil. We note no difference between northern and southern specimens, and all agree in having fewer gill-rakers than *V. brevoortii,* the Pacific coast representative of this species.

Known from Maine to Uruguay. Our specimens are from Toro Point, Mindi Cut, Mindi Reef, Fox Bay, Colon; Colon market and Porto Bello.

279. Selene brevoortii (Gill). (Plate XXXII.)

Argyriosus brevoortii Gill, Proc. Ac. Nat. Sci. Phila., 1863, 83 (Lower California; young).

Argyreiosus pacificus Lockington, Proc. Cal. Ac. Sci., VII, 1876 (1877), 84 (Lower California; adult).

Argyreiosus vomer Lütken, (Dan. Vid. Selsk. Skr., 5 ser., XII) Spolia Atlantica, 1880, 137 (part; with figures of changes due to age).

Selene vomer Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 439 (part), and Proc. U. S. Nat. Mus., 1882, 625; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 82 (Panama Bay; not of Linnæus).

Head 2.24 to 2.55; depth 1.2 to 1.6; D. VII or VIII-I, 21 or 22; A. II-I, 17 to 19.

Body ovate, very strongly compressed, the outlines strongly trenchant, scarcely as deep as *S. vomer,* the depth 1.53 to 1.6 in length of specimens about 200 mm. long; back much elevated; the anterior profile ascending at a steep angle, straight or slightly concave, forming an angle at occipital region; ventral outline anteriorly little curved, angulated at origin of anal; head short and deep; snout little projecting, 1.75 to 2 in head; eye 4.05 to 5.2; mouth moderate, oblique;

lower jaw in advance of upper; maxillary broad, failing to reach vertical from anterior margin of eye, 2.8 to 3.3 in head; teeth minute, those on upper jaw in a narrow band, those on lower jaw mostly in a single series; vomerine teeth in a triangular patch; palatine teeth weak or wanting; tongue with a band of villiform teeth; gill-rakers slender, close set, 28 to 32, besides one or two rudiments, on the lower limb of first arch; scales very small, rudimentary; lateral line with a prominent arch, usually somewhat shorter than head, straight portion unarmed, an accessory branch present, extending from scapula to below origin of spinous dorsal; first dorsal with 7 or 8 spines, the second, third and fourth bearing filaments which are often more than twice the length of body in young, the longest spine about as long as eye in adult; second dorsal and anal similar, falcate, the anterior rays much produced, the first one filamentous in adult, the fins lower and without filaments in young; caudal widely forked, the lobes of about equal length; ventrals very small in adult, scarcely as long as eye, much produced in young but not filamentous, about half as long as the body in specimens 40 mm. in length; pectorals long and falcate in adult, proportionately shorter in young, 2.25 to 3.65 in length of body.

Color bluish green above, sides silvery; very young with a blackish bar extending from snout through eye to origin of first dorsal; sides with indistinct vertical bars or blackish blotches; fins mostly pale in adult; filament of dorsal blackish; the produced rays and filaments in young bluish black.

The present collection contains 30 specimens of this species, ranging from 40 to 250 mm. in length. This species, although long confounded with the Atlantic coast form, *S. vomer*, may be distinguished without fail, as is indicated by the large series examined, by the constantly larger number of gill-rakers. In comparing specimens of equal size, it is also noted that this species is scarcely as deep as *S. vomer*.

Known from Lower California to Peru. Our specimens are from Chame Point; tide streams, Corozal; tide streams, beach and the bay, Balboa; and Panama City market.

280. Selene œrstedii Lütken.

Selene ϕrstedii Lütken, (Dan. Vid. Selsk. Skr., 5 ser., XII) Spolia Atlantica, 1880, 144 (Punta Arenas).

Selene œrstedii Jordan & Gilbert, Proc. U. S. Nat. Mus., 1883, 205; Jordan & Evermann, Bull. U. S. Nat Mus. XLVII, 1896, 935; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 81 (Panama Bay).

Head 2.5 to 3.06; depth 1.4 to 1.65; D. VIII-I, 16 to 18; A. II-I, 15 or 16.

Body ovate, much compressed, the outlines trenchant, but not as much so as in other species of this genus; back much elevated; the anterior profile straight or slightly concave over snout, convex above level of eyes; the ventral outline anteriorly only slightly convex, angulated at origin of anal; head very short and deep; snout little projecting, 1.85 to 2.2 in head; eye 3.7 to 4.3; mouth moderate, slightly oblique; lower jaw slightly in advance of the upper; maxillary broad, reaching about to vertical from anterior margin of eye, 2.95 to 3.5 in head; teeth small, those on jaws in narrow bands; vomerine teeth in triangular patch with a backward projection; palatines toothless; tongue with a rather large band of villiform teeth; gill-rakers strong, rather far apart, about half as long as eye, 13 to 16, besides one or two rudiments, on the lower limb of first arch; scales very small, rudimentary; lateral line with a prominent arch, about as long as head, the straight portion unarmed; an accessory lateral line present, extending from scapula to below anterior rays of spinous dorsal; first dorsal with 8 spines, the anterior 5 or 6 connected by membrane, the anterior spines very long and slender in very young (35 mm. long), the second equaling about three-fourths the length of body, becoming proportionately much shorter with age, shorter than snout in adult (300 mm. long); second dorsal and anal similar, falcate, the anterior rays much produced, the first ray filamentous in adult, often reaching past tip of caudal, these fins anteriorly much lower in young, and none of the rays produced into filaments; caudal very broadly forked, the lobes subequal; ventrals rather large, equal to postorbital part of head in adult, at least two-thirds the length of body in very young, none of the rays filamentous; pectorals long and falcate in adult, much shorter in young, 2.1 to 3.5 in length of body.

Color of adult plain bluish green above, sides silvery; head often with dusky punctulations; fins all with more or less dusky; axil of pectoral black; very young mostly black, with a prominent black bar extending from posterior angle of mouth through eye to base of anterior dorsal spines; in larger specimens the black of the body is broken up, often appearing as indistinct cross-bars; the produced fins in the young are jet black; caudal pale.

The present collection contains 17 specimens of this species, ranging from 35 to 310 mm. in length. This species is easily distinguished from other species of this genus by the less compressed body, less

trenchant outlines, and by the scarcely angulated occipital region. The gill-rakers are also much stronger and fewer in number.

Known from the Pacific coast of tropical America, from Mazatlan to Panama. Our specimens are from Chame Point, Balboa and the Panama City market.

111. Genus **Trachinotus** Lacépède.

Trachinotus Lacépède, Hist. Nat. Poiss., III, 1802, 78 (type *Scomber falcatus* Forskål).

Cæsiomorus Lacépède, Hist. Nat. Poiss., III, 1802, 92 (type *Cæsiomorus baillonii* Laécèpde).

Acanthinion Lacépède, Hist. Nat. Poiss., IV, 1803, 499 (type *Chætodon rhomboides* Linnæus).

Bothrolæmus Holbrook, Ichth. South Carolina, Ed. I, 1855, 80 (type *Trachinotus pampanus* Cuvier & Valenciennes=*Gasterosteus carolinus* Linnæus).

Doliodon Girard, Proc. Ac. Nat. Sci. Phila., 1859, 168 (type *Gasterosteus carolinus* Linnæus).

Body short, compressed, more or less ovate; abdomen shorter than anal fin, never trenchant; head short, compressed; snout extremely blunt; mouth slightly oblique, the upper jaw a little in advance of the lower; premaxillaries protractile; maxillary without a distinct supplemental bone, reaching about middle of eye; preopercle serrate in very young, becoming entire with age; gill-membranes considerably united across isthmus; gill-rakers short and rather few; teeth in young in villiform bands on jaws, vomer, palatines, and sometimes on tongue, almost or entirely disappearing with age; scales small and smooth; lateral line scarcely arched, entirely unarmed; spinous dorsal with 6 short, strong spines, connected by membrane in young, free and proportionately shorter in adult; second dorsal and anal similar, anteriorly more or less elevated in adult, sometimes long and falcate, very little if at all elevated in very young; anal preceded by 2 strong spines; caudal broadly forked, the lobes produced in adult; ventrals rather small, usually shorter than postorbital part of head; pectorals never falcate, constantly shorter than head.

KEY TO THE SPECIES.

a. Second dorsal with 17 to 21 rays; anal with 16 to 20 rays.

b. Body deep, ovate, the depth 1.3 to 1.8 in length; sides without black cross-bars.

c. Second dorsal and anal anteriorly greatly elevated, the longest rays reaching nearly to base of caudal in adult; much shorter in young; dorsal with 19 to 21 rays. *falcatus*, p. 378.

cc. Second dorsal and anal not greatly elevated, the longest rays reaching only slightly past middle of base of fins in adult; scarcely elevated in young; dorsal with 17 or 18 rays.

d. Body slightly elongate, the depth 1.6 to 1.8 in length; head short and very deep; profile from snout to dorsal rather strongly convex; maxillary reaching slightly past middle of eye, 2.75 to 2.9 in head; color mostly silvery; a black blotch under base of pectoral rays. *kennedyi*, p. 380.

dd. Body ovate, the depth 1.3 to 1.57 in length; head lower; profile from snout to dorsal a straight oblique, or very slightly convex line; maxillary scarcely reaching middle of eye, 3.0 to 3.45 in head; general color reddish or blackish; no black blotch under base of pectoral rays. *culveri*, p. 381.

bb. Body moderately elongate, the depth 1.8 to 2.65 in length; sides with evident black cross-bars, except in very young.

e. Gill-rakers less than a third the length of eye, 8 to 10 on the lower limb of first arch; anal usually with 17, occasionally with 18, rays. *glaucus*, p. 382.

ee. Gill-rakers at least half as long as eye, 13 to 15 on lower limb of first arch; anal usually with 18 or 19, rarely with 20, rays. *rhodopus*, p. 383.

aa. Second dorsal with 23 to 27 rays; anal with 20 to 24 rays.

f. Body rather deep; in specimens about 80 mm. in length, the depth 2.15 to 2.35 in length; gill-rakers very short, less than a third the length of eye, 7 or 8, rarely 9, on lower limb of first arch; second dorsal usually with 24, occasionally with 23 or 25, rays; anal with 21, rarely with 23, rays. *carolinus*, p. 385.

ff. Body elongate; in specimens about 80 mm. in length, the depth 2.45 to 2.65 in length; gill-rakers longer, about half the length of eye, 9 or 10, rarely only 8, on lower limb of first arch; second dorsal usually with 26 or 27, occasionally with only 25 rays; anal with 22 or 23, rarely with 24 or 25, rays. *paloma*, p. 386.

281. Trachinotus falcatus (Linnæus). (Plate XXXIII.)

Labrus falcatus Linnæus, Syst. Nat., Ed. X, 1758, 284 (America).

Chætodon rhomboides Bloch, Naturg. Ausl. Fische, III, 1787, 100, Pl. CCIX (on a drawing by Plumier).

Acanthinion rhomboides Lacépède, Hist. Nat. Poiss., IV, 1803, 500.

Trachinotus rhomboides Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 1831, 407.

Trachinotus fuscus Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 1831, 410 (Brazil).

Trachinotus spinosus De Kay, Fauna N. Y., Fishes, 1842, 117, Pl. XIX, fig. 53.

Lichia spinosus Baird, 9th Rept. Smith. Inst., 1854 (1855), 336.

Doliodon carolinus Girard, U. S. & Mex. Bound. Surv., II, Pt. II, Fishes, 1859, 22, Pl. XI, fig. 4.

Trachynotus ovatus Günther, Cat. Fish. Brit. Mus., II, 1860, 481 (in part; not of Linnæus).

Trachynotus rhomboides Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 974; Meek & Goss, Proc. Ac. Nat. Sci. Phila., 1884, 124.

Trachinotus falcatus Jordan, Proc. U. S. Nat. Mus., 1886, 575; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 941, Pl. CXLVI, fig. 396; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 132 (Colon).

Head 2.75 to 3.75; depth 1.45 to 1.8; D. VII-I, 19 to 21; A. II-I, 17 or 18.

Body more or less ovate, strongly compressed; the back much elevated; profile of snout nearly vertical, from snout to second dorsal moderately convex; dorsal and ventral outlines forming a marked angle at origin of second dorsal and anal; head short and deep; snout very short and blunt, 3.65 to 5 in head; eye 2.96 to 4; mouth small, slightly oblique; upper jaw in advance of the lower; maxillary rather wide, scarcely reaching middle of eye, 2.8 to 3.1 in head; teeth almost wholly wanting in adult, present on both jaws, vomer, palatines and tongue in young; gill-rakers very short, less than a third the length of eye, 9 to 12 on the lower limb of first arch; scales minute, partly embedded; lateral line with only a slight arch, wholly unarmed; first dorsal with 6 short, stiff spines; second dorsal and anal produced in adult, the longest reaching nearly to base of caudal; these fins anteriorly only slightly elevated in small specimens; caudal broadly forked, the lobes produced in adult, much shorter in young; ventrals small, slightly shorter than postorbital part of head; pectorals constantly shorter than head, 4.4 to 5.15 in length of body.

Color bluish or blackish above, usually silvery below; in dark colored specimens the lower part of sides as well as abdomen densely punctulate with dark points; paler specimens with the anterior rays

of second dorsal and anal, and outer rays of caudal black, the rest of fins mostly pale; dark specimens mostly with black fins; no black blotch under base of pectoral rays.

The present collection contains 36 specimens of this species, ranging in length from 35 to 290 mm.

Known from Cape Cod to Brazil. Our specimens are from Toro Point; Fox Bay, Colon, and the Colon market.

282. Trachinotus kennedyi Steindachner. (Plate XXXIV.)

Trachinotus kennedyi Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXII) Ichth. Beitr., III, 1875, 47, Pl. VII, fig. 9 (Magdalena Bay, Lower California); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 942; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 84 (Panama Bay); Starks, Proc. U. S. Nat. Mus., 1906, 786 (Ecuador).

Trachynotus kennedyi Meek & Goss, Proc. Ac. Nat. Sci. Phila., 1884, 123.

Head 3.32 to 3.5; depth 1.6 to 1.8; D. VI-I, 17 or 18; A. II-I, 16 or 17.

Body rather deep, but scarcely ovate, strongly compressed; the back rather strongly elevated; profile of snout almost vertical, from snout to dorsal rather strongly convex; dorsal and ventral outlines forming broad obtuse angles at origin of second dorsal and anal; head short and deep, high at nape; snout very short and blunt, 4.15 to 4.4 in head; eye 3.4 to 3.5; mouth moderate, slightly oblique; upper jaw in advance of the lower; maxillary reaching slightly past middle of eye, 2.75 to 2.9 in head; teeth almost wholly wanting in adult; the young with feeble teeth; gill-rakers less than one-third the length of eye, 9 to 11 on the lower limb of first arch; scales minute, more or less embedded; lateral line anteriorly with a broad angle, entirely unarmed; first dorsal with 6 short, stiff spines; second dorsal and anal similar, anteriorly only moderately elevated, the longest rays reaching about middle of base of fins when deflexed; caudal broadly forked, the lobes in adult much longer than head; ventrals small, somewhat shorter than postorbital part of head; pectorals constantly shorter than head, 3.95 to 4 in length of body.

Color bluish or grayish above, lower part of sides and abdomen silvery; elevated portion of dorsal, caudal and pectorals black or dusky; other fins mostly pale or yellowish in life; a black blotch present under base of pectoral rays.

The present collection contains only 2 specimens of this species, 225 and 260 mm. in length. We have for comparison one specimen, 265 mm. in length, collected by Dr. Gilbert and associates who found the species more common at Panama than the present authors. The above description is based on the three specimens mentioned. This species is close to *T. falcatus,* but the dorsal fin is slightly shorter, and the second dorsal and anal are much lower anteriorly. This last difference, owing to the great change the dorsal and anal undergo with age, is noticeable only when specimens nearly of like size are compared.

Known from Lower California to Guayaquil. Our specimens are from the Panama City market.

283. Trachinotus culveri Jordan & Starks. (Plate XXXV.)

Trachinotus culveri Jordan & Starks, in Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 439, Pl. XXXVI (Mazatlan); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 942, Pl. CXLVII, fig. 397; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 84 (Panama Bay).

Head 2.9 to 3.5; depth 1.3 to 1.57; D. VI-I, 17 or 18; A. II-I, 16 or 17.

Body ovate, strongly compressed; the back strongly elevated; profile of snout vertical, from snout to second dorsal ascending in a straight, oblique or slightly convex line; dorsal and ventral outline scarcely angulate at origin of second dorsal and anal in adult, evenly convex in young; head short, rather low at nape; snout extremely short and blunt, 4.25 to 5.15 in head; eye 3.2 to 3.7; mouth small, slightly oblique; upper jaw very little in advance of the lower; maxillary scarcely reaching middle of eye, 3 to 3.45 in head; teeth present in villiform bands on jaws, vomer, palatines and tongue in specimens at hand; gill-rakers less than a third the length of eye, 9 to 11 on the lower limb of first arch; scales minute, embedded; lateral line nearly straight, unarmed; first dorsal with 6 short, stiff spines, separate in adult, connected by membrane in young; second dorsal and anal similar, anteriorly moderately elevated in adult, the longest rays reaching slightly past middle of base of fins when deflexed, in very young the outer margin of these fins evenly convex; caudal broadly forked, the lobes produced in adult, notably longer than head, not produced in young and shorter than head; ventrals small, notably shorter than postorbital part of head; pectorals constantly shorter than head, 4 to 5.8 in length of body.

Color bluish or black above; some small specimens wholly reddish black; lighter colored specimens with the lower part of sides and abdomen pale with dusky punctulations; fins of all of our largest specimens dusky, the produced portion of second dorsal and the tips of lobes of caudal black; caudals and pectorals pale in young; other fins mostly black; no black blotch under base of pectoral rays.

The young were taken in large numbers at Taboga Island, swimming at the surface, among dead leaves, which were of the same color as the fish.

Of this species there are 154 specimens, ranging in length from 20 to 195 mm., in the present collection. This species differs from *T. falcatus* in the slightly shorter dorsal fin, in the less convex dorsal profile, and in the much lower vertical fins. It differs from *T. kennedyi* in the lower head, the less convex dorsal profile, slightly deeper body, and shorter maxillary. The color of *T. culveri*, in specimens at hand, is much darker and the black blotch under base of pectoral rays is wanting.

Known from Mazatlan to Panama. Our specimens are from Chame Point, Taboga Island, and the Panama City market.

284. Trachinotus glaucus (Bloch). (Plate XXXVI, fig. 1.)

Chætodon glaucus Bloch, Naturg. Ausl. Fische, III, 1787, 112, Pl. CCX (Martinique; on a figure by Plumier).

Trachinotus glaucus Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 1831, 400; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 940, PL. CXLVI, fig. 395; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 132 (Colon).

Trachynotus glaucus Günther, Cat. Fish. Brit. Mus., II, 1860, 483; Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 270; Meek & Goss, Proc. Ac. Nat. Sci. Phila., 1884, 122.

Trachynotus rhodopus Meek & Goss, Proc. Ac. Nat. Sci. Phila., 1884, 125 (part).

Head 3 to 3.9; depth 1.9 to 2.65; D. V or VI-I, 19 or 20; A. II-I, 17 or 18.

Body more or less elongate, strongly compressed; the back moderately elevated; profile over snout very steep, from snout to origin of second dorsal only slightly convex; dorsal and ventral outlines forming broad, obtuse angles at origin of second dorsal and anal; head rather low; snout very blunt, 3.7 to 4.75 in head; eye 3 to 4.1; mouth rather small, oblique; upper jaws in advance of lower; maxillary of

moderate width, reaching about middle of eye, 2.2 to 2.76 in head; teeth in jaws in villiform bands; vomer and palatines each with a small patch of teeth; tongue toothless; gill-rakers very short and sharply pointed, less than a third the length of eye, 8 to 10 on lower limb of first arch; scales small, more or less embedded; head with a few scattered scales; lateral line with only a slight curve, and wholly without bony scutes; first dorsal with 6 short, stiff spines, the first one occasionally becoming obsolete in adult; second dorsal and anal similar, the anterior rays very much produced, reaching nearly to tip of caudal in adult, little, if at all, produced in specimens less than 80 mm. in length; caudal deeply forked, the lobes much produced in adult, much shorter in young; ventrals rather small, about as long as postorbital part of head; pectorals constantly shorter than head, 4.55 to 5.5 in length of body.

Color variable, from bluish black to pale brown above, silvery below; sides with 4 or 5 cross-bars, which vary much in width and intensity, wholly wanting on specimens less than 75 mm. in length; produced rays of dorsal and anal and outer rays of caudal black; fins otherwise mostly pale.

We have only 4 small specimens of this species, ranging from 35 to 80 mm. in length. We have also examined specimens of this species from North Carolina, Bahama Islands, Cuba and Honduras. The above description is based on all the material examined.

Known from Virginia southward to Argentina. Our specimens are from Toro Point, and Porto Bello.

285. Trachinotus rhodopus Gill. (Plate XXXVII.)

Trachynotus rhodopus Gill, Proc. Ac. Nat. Sci. Phila., 1863, 85 (Cape San Lucas; young of 2 inches); Meek & Goss, Proc. Ac. Nat. Sci. Phila., 1884, 125 (in part; not of Gill).

Trachynotus nasutus Gill, Proc. Ac. Nat. Sci. Phila., 1863, 85 (Cape San Lucas; young of 1 inch).

Trachynotus fasciatus Gill, Proc. Ac. Nat. Sci. Phila., 1863, 86 (Panama).

Trachynotus glaucoides Günther, Proc. Zoöl. Soc. London, 1864, 150 (San José, Guatemala).

Trachinotus rhodopus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 941; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 82 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 100.

Head 3 to 4.1; depth 1.8 to 2.65; D. VI-I, 19 to 21; A. II-I, 18 to 20.

Body more or less elongate, strongly compressed; the back moderately elevated; profile of snout very steep, from snout to second dorsal only slightly convex; dorsal and ventral outlines forming broad obtuse angles at origin of second dorsal and anal; head rather low; snout blunt, 3.9 to 4.4 in head; eye 3.3 to 4.2; mouth rather small, slightly oblique; upper jaw in advance of lower; maxillary of moderate width, reaching about middle of eye, 2.3 to 2.8 in head; teeth in jaws in villiform bands; vomer and palatines each with a small patch of teeth; tongue toothless; gill-rakers rather long and blunt, at least half as long as eye, 13 to 15 on the lower limb of first arch; scales small, more or less embedded; head mostly without scales; lateral line with only a very slight curve, and wholly without bony scutes; first dorsal with 6 short, stiff spines; second dorsal and anal similar, the anterior rays much produced, reaching nearly to tip of caudal in adult, little, if at all, produced in specimens less than 80 mm. in length; caudal deeply forked, the lobes produced in adult, much shorter in young; ventrals rather small, as long as postorbital part of head; pectorals constantly shorter than head, 4.7 to 5.65 in length of body.

Color black or brownish above, silvery below; sides with 4 or 5 black cross-bars, which vary greatly in width and intensity, wholly wanting in specimens less than about 75 mm. in length; fins in dark specimens mostly black; in light specimens only the produced rays of dorsal and anal and outside rays of caudal are black; a black blotch under base of pectoral usually present.

Of this species 110 specimens, ranging from 30 to 285 mm. in length, were secured. This species differs from *T. glaucus*, its Atlantic representative, in the longer and more numerous gill-rakers, and in the slightly longer anal. The average number of soft anal rays in 12 specimens is 18.7+ in *T. rhodopus*. For the same number of specimens it is 17.9+ in *T. glaucus*. The difference in profile mentioned by Jordan & Evermann (Bull. U. S. Nat. Mus., XLVII, p. 941) is an unreliable character. The dorsal profile is greatly changed when the fish is preserved with the mouth open, becoming less convex or even slightly concave. In specimens with the mouth closed, we can not detect the slightest difference with respect to the dorsal profile.

Known from the Pacific coast of tropical America, from Mazatlan to Tumaco, Colombia. Our specimens are from Chame Point, Taboga Island and the Panama City market.

286. Trachinotus carolinus (Linnæus).

Gasterosteus carolinus Linnæus, Syst. Nat., Ed. XII, 1766, 490 (Carolina).

Trachinotus argenteus Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 1831, 413 (New York; Rio de Janeiro).

Trachinotus cupreus Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 1831, 414 (Martinique).

Trachinotus pampanus Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 1831, 414, Pl. CCXXXVII (Brazil).

Doliodon carolinus Girard, Proc. Ac. Nat. Sci. Phila., 1858, 168.

Bothrolæmus pampanus Holbrook, Ichth. South Carolina, Ed. I, 1855, 81 (Charleston).

Trachynotus carolinus Gill, Proc, Ac. Nat. Sci. Phila., 1862, 438.

Trachinotus carolinus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 944, Pl. CXLVII, fig. 398.

Head 3.2 to 4.15; depth 2.0 to 2.35; D. V or VI-I, 23 to 25; A. II-I, 20 to 23.

Body elongate, strongly compressed; the back moderately elevated; profile of snout strongly convex, from snout to second dorsal moderately and evenly convex; body outlines without marked angles at origin of second dorsal and anal; head short and rather deep; snout short and blunt, 4.2 to 4.9 in head; eye 3.2 to 4.6; mouth moderate, slightly oblique; upper jaw in advance of the lower; maxillary reaching to or slightly past middle of eye, 2.7 to 3.0 in head; teeth weak, in villiform bands in young, becoming obsolete with age; gill-rakers short, less than a third the length of eye, 7 or 8, rarely 9, on lower limb of first arch; scales minute, embedded; lateral line nearly straight, entirely unarmed; first dorsal with 6, rarely with 5, short, stiff spines connected by membrane in young, separate in adult; second dorsal and anal similar, anteriorly not greatly elevated, the longest rays in adult reaching about middle of base of fins when deflexed, much shorter in young; caudal widely forked, the lobes longer than head in adult, shorter in young; ventrals small, usually slightly shorter than postorbital part of head; pectorals shorter than head, 4.2 to 5.55 in length of body.

Color bluish above, silvery below; ventrals pale; other fins usually black or dusky.

This species was not taken by us. It is here described from specimens from Massachusetts, New York, New Jersey, North Carolina and Yucatan, ranging in length from 70 to 365 mm.

Known from Massachusetts to Brazil.

287. Trachinotus paloma Jordan & Starks. (Plate XXXVI, fig. 2.)

Trachinotus paloma Jordan & Starks, in Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 437 (Mazatlan); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 945; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 84 (Panama Bay); Starks, Proc. U. S. Nat. Mus., 1906, 786 (Ecuador).

Head 3.4 to 3.7; depth 2.25 to 2.65; D. VI-I, 25 to 27; A. II-I, 22 to 24.

Body elongate, strongly compressed; the back not greatly elevated; profile of snout strongly convex, from snout to second dorsal only slightly convex; outlines of body not angulate at origin of second dorsal and anal; head rather short and low; snout rather blunt, 3.6 to 4.45 in head; eye 4 to 4.8; mouth moderate, oblique; the upper jaw in advance of the lower; maxillary reaching about middle of eye, 2.6 to 2.9 in head; teeth weak, in villiform bands in young (no adult specimens at hand); gill-rakers moderate in length, about half the length of eye, 9 or 10, rarely only 8, on lower limb of first arch; scales minute, more or less embedded; lateral line nearly straight, entirely unarmed; first dorsal with 6 short, stiff spines, connected by membrane in very young, separate in adult; second dorsal and anal similar, anteriorly not greatly elevated, the longest rays failing to reach middle of base of fins when deflexed in largest specimens at hand, shorter in young; caudal widely forked; ventrals small, scarcely as long as postorbital part of head; pectorals shorter than head, 4.85 to 5.8 in length of body.

Color bluish or grayish above, silvery below; ventrals pale; other fins all with more or less black or dusky; the elevated portion of dorsal always black.

Of this species there are only 7 small specimens, ranging from 75 to 80 mm. in length, in the present collection. Besides these we have examined 6 specimens, ranging from 70 to 140 mm. in length, from Cape San Lucas. This species is very close to *T. carolinus,* from which it appears to differ in the following characters: (a) The body is scarcely as deep, this character being apparent only when specimens of like size are compared. The body of both species appears to increase with age and thus measurements overlap. In specimens about 80 mm. in length, the depth is contained 2.45 to 2.65 in length in *T. paloma;* in *T. carolinus,* 2.15 to 2.35. (b) The gill-rakers are longer and slightly greater in number. (c) The soft dorsal and anal are slightly longer. In the 12 specimens at hand of *T. paloma,* 2 have 25 rays in the soft dorsal, 6 have 26, and 4 have 27. In 4 specimens

the anal has 22 rays, in 6 it has 23, in one it has 24 and in another it has 25. In 20 specimens of *T. carolinus,* 3 have 23 rays in the soft dorsal, 14 have 24, and 3 have 25. In the anal fin one specimen has 20 rays, 11 have 21, 7 have 22, and one has 23.

Known from Lower California to Peru. Our specimens are from Chame Point.

112. Genus **Oligoplites** Gill.

Oligoplites Gill, Proc. Ac. Nat. Sci. Phila., 1863, 166 (type *Oligoplites occidentalis* Gill=*Scomber saurus* Bloch & Schneider).

Body compressed, oblong or lanceolate; dorsal profile anteriorly with sharp keel; head short, compressed and rather pointed; mouth rather large, oblique; lower jaw usually slightly projecting, premaxillaries not protractile, except in very young; maxillary long and very narrow, without a distinct supplemental bone; teeth present in both jaws, vomer, palatines and tongue, none on pterygoids, those on jaws in bands; gill-rakers rather long; scales small, linear, embedded in the skin and placed at different angles to each other; lateral line anteriorly with a low arch or broad angle, unarmed; dorsal spines 3 to 5, connected at base by low membranes; second dorsal and anal similar and of about equal length, more or less elevated anteriorly, with deep notches between their posterior rays; anal preceded by 2 strong spines; pectoral fins very short.

KEY TO THE SPECIES.

a. Head above with numerous pores which lead to canals which ramify under the skin; gill-rakers rather few, 7 to 11, exclusive of rudiments, on the lower limb of first arch.

b. Body elongate, the dorsal outline not angulate at origin of second dorsal; head short, 4.25 to 4.3 in length of body; mouth moderate, the maxillary reaching posterior margin of eye in adult, 1.65 to 1.75 in head; band of teeth in lower jaw with an outside series of slightly enlarged, very close set, laterally compressed, movable teeth. *altus,* p. 388.

bb. Body deep, the dorsal outline angulate at origin of second dorsal; head longer, 3.8 to 4.05 in length of body; mouth very large, the maxillary reaching much beyond eye in adult, to posterior margin of eye in very young, 1.45 to 1.65 in head; band of teeth in lower jaw with an outside series of slightly enlarged, well separated, pointed teeth. *mundus,* p. 389.

aa. Head without pores and canals; gill-rakers more numerous, 13 to 17 on the lower limb of first arch.

c. Body moderately elongate, its depth 3.3 to 4.0 in its length; mouth rather large, the maxillary reaching slightly past middle of eye in very young, past posterior margin of eye in adult; band of teeeth in lower jaw, with the outside series somewhat enlarged, composed of well separated pointed teeth.

d. A well developed membrane connecting anterior part of the first branchiostegal rays across the isthmus. *saliens,* p. 390.

dd. No membrane connecting anterior branchiostegal rays across isthmus. *saurus,* p. 390.

cc. Body very elongate, its depth 4.0 to 4.6 in its length; mouth small, the maxillary not reaching past middle of eye, 2.3 to 2.45 in head; bands of teeth in lower jaw with an outside series of slightly enlarged, very close set, laterally compressed, movable teeth. *refulgens,* p. 392.

288. Oligoplites altus (Günther). (Plate XXXVIII, fig. 1.)

Chorinemus altus Günther, Trans. Zoöl. Soc. London, VI, 1869, 433 (Panama).

Oligoplites altus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 374; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 899; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 72, Pl. XI, fig. 20 (Panama Bay).

Head 4.25 to 4.3; depth 3.0 to 3.2; D. IV or V-I, 20; A. II-I, 20.

Body slender, compressed; dorsal profile anteriorly nearly straight, not forming an angle at the origin of the second dorsal; lower outline a little more strongly rounded than the upper; head short, its upper surface with numerous pores; snout rather pointed, 4.4 in head; eye 3.7; mouth quite oblique; lower jaw projecting; maxillary narrow, reaching posterior margin of eye, 1.65 to 1.75 in head; teeth small, present on both jaws, vomer, palatines and tongue; the teeth in jaws in bands, the one on lower jaw very wide, with an outer row of very close set, movable, laterally compressed teeth projecting above the other teeth; gill-rakers short, the longest only slightly longer than half the diameter of eye, 10 or 11, exclusive of rudiments, on the lower limb of first arch; anterior branchiostegal rays connected across isthmus by a thin transparent membrane; scales long and narrow, numerous, and placed at angles to each other as in *O. saliens;* lateral line with a low arch anteriorly, sometimes forming a broad obtuse angle; spines of first dorsal connected by low membranes at base; second dorsal and anal anteriorly not much elevated, the longest rays reaching little, if

at all, past the tips of the succeeding rays when deflexed, the lower portion of fins with deep notches between the rays; ventrals inserted a little nearer the origin of anal than tip of mandible, reaching nearly or quite to vent; pectorals of moderate length, 1.4 in head.

Color bluish above, sides silvery; fins mostly yellowish green in life.

Only 2 specimens of this species were secured, respectively 220 and 240 mm. in length.

Known from the Pacific coast of Panama to Guayaquil. All records from other localities which we have examined are very probably referable to *O. mundus*. Our specimens are from Chame Point and the Panama City market.

289. Oligoplites mundus Jordan & Starks. (Plate XXXVIII, fig. 2.)

Oligoplites mundus Jordan & Starks, in Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 344 (Mazatlan, Mexico; name only); Jordan & Starks, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2844 (first description); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 74, Pl. XII, fig. 21 (Panama Bay); Starks, Proc. U. S. Nat. Mus., 1906, 784 (Ecuador).

Head 3.8 to 4.05; depth 2.75 to 3.1; D. IV-I, 18 or 19; A. II-I, 18 to 20.

Body deep, strongly compressed; dorsal profile nearly straight anteriorly, forming an angle at origin of second dorsal; ventral outline strongly convex; head rather large, its upper surface with numerous pores; snout pointed, 4.45 to 5.1 in head; eye 3.4 to 4.45; mouth very oblique; lower jaw projecting; maxillary very long and narrow, reaching much beyond eye in adult, scarcely to posterior margin of eye in very young, 1.45 to 1.65 in head; teeth small, present on both jaws, vomer, palatines and tongue; the teeth in jaws in bands, the one on lower jaw of moderate width, with the inner and outer series somewhat enlarged, composed of well separated, pointed teeth; gill-rakers few, the longest about two-thirds the length of eye, 7 to 9, exclusive of rudiments, on the lower limb of first arch; anterior branchiostegal rays connected across the isthmus by a thin, transparent membrane; scales very long and narrow, fewer and more scattered than in *O. altus*; lateral line with a low arch, sometimes forming a broad obtuse angle; spines of first dorsal connected by low membranes at base; second dorsal and anal moderately elevated anteriorly, the longest rays reaching past the tips of succeeding rays when deflexed, the low portion of fins with notches between the rays; ventrals inserted

a little nearer origin of anal than tip of mandible, failing to reach vent in adult, reaching to or past vent in young; pectorals rather short, 1.5 to 1.8 in head.

Color bluish above, sides silvery; fins mostly yellowish in life.

This species is represented by 49 specimens, ranging from 65 to 345 mm. in length.

Known from the Gulf of California to Ecuador. Our specimens are from tide streams, Corozal; tide streams, beach, and Panama Bay at Balboa, and the Panama City market.

290. Oligoplites saliens (Bloch).

Scomber saliens Bloch, Naturg. Ausl. Fische, VII, 1793, 49, Pl. CCCXXXV (Antilles).

Scomberoides saltator Lacépède, Hist. Nat. Poiss., II, 1800, Pl. XIX, fig. 2 (opposite p. 596), text, III, 1802, 55.

Chorinemus saliens Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 1831, 389.

Oligoplites saliens Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 899; Starks, Proc. U. S. Nat. Mus., 1906, 784, and Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 43.

This species was not seen by us. It is said to differ from *O. saurus* in having a well developed membrane connecting the anterior part of the first pair of branchiostegal rays across the isthmus. The maxillary is more evenly and gently curved downward, and longer, reaching past eye in specimens over 180 mm. long (see Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, pp. 43 & 44).

Recorded from the West Indies and Brazil.

291. Oligoplites saurus (Bloch & Schneider). (Plate XXXIX, fig. 1.)

Scomber saurus Bloch & Schneider, Syst. Ichth., 1801, 321 (Jamaica; based on the Leather Coat, or *Saurus argenteus* of Browne).

Centronotus argenteus Lacépède, Hist. Nat. Poiss., III, 1802, 316 (Equatorial America).

Lichia quiebra Quoy & Gaimard, in Freycinet, Voy. Uranie et Physicienne, Zoöl., 1824, 365 (Equatorial America).

Chorinemus saltans Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 1831, 393 (Martinique, San Domingo, and Brazil).

Chorinemus occidentalis Günther, Cat. Fish. Brit. Mus., II, 1860, 475 (not *Gasterosteus occidentalis* Linnæus); Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 3.

Oligoplites inornatus Gill, Proc. Ac. Nat. Sci. Phila., 1863, 166 (Panama).

Oligoplites occidentalis Gill, Proc. Ac. Nat. Sci. Phila., 1863, 167.

Chorinemus inornatus Günther, Trans. Zoöl. Soc. London, VI, 1869, 433.

Scombroides occidentalis Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 447.

Oligoplites saurus Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 70 (Panama Bay); Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 43.

Head 3.7 to 4.8; depth 3.3 to 4.0; D. V-I, 19 to 21; A. II-I, 19 to 21.

Body rather slender, strongly compressed; dorsal profile anteriorly nearly straight, and not angulated at origin of second dorsal; lower outline anteriorly about evenly convex; head rather long, its upper surface without pores; snout pointed, 3.4 to 4 in head; eye 3.44 to 4.2; mouth oblique; lower jaw slightly projecting; maxillary very narrow, reaching to or slightly past posterior margin of eye in adult, only slightly past middle of eye in young of about 55 mm. in length, 1.7 to 1.85 in head; teeth small, present on both jaws, vomer, palatines and tongue, those on jaws in bands, the one on lower jaw of moderate width, with the inner and outer series somewhat enlarged, composed of well separated, pointed teeth; gill-rakers about two-thirds the length of eye, 13 or 14, exclusive of rudiments, on the lower limb of first arch; anterior branchiostegal rays not connected across the isthmus by a membrane; scales long and very narrow, placed obliquely and at angles to each other; lateral line with a low arch anteriorly, which sometimes forms a broad obtuse angle; spines of first dorsal connected by membranes at base; second dorsal and anal little elevated anteriorly, the longest rays not reaching past tips of succeeding rays when deflexed, the low portions of fins with deep notches between the rays; ventrals inserted slightly nearer origin of anal than tip of mandible, usually reaching to or slightly past vent; pectorals short, 1.57 to 1.85 in head.

Color bluish above, sides silvery; fins mostly yellowish in life.

We have 55 specimens of this species, ranging from 25 to 300 mm. in length. Of these 31 are from the Atlantic coast and 24 from the Pacific. Numerous specimens from the West Indies, Florida, Texas, Nicaragua, Brazil, and the west coast of Mexico and Central America were also examined. We are unable to detect any differences between Atlantic and Pacific specimens, or between specimens from northern and southern localities. The length of the maxillary varies with age. In

large examples it reaches to or slightly past posterior margin of eye, while in the very young it reaches only slightly past middle of eye. The comparative width of the lowest suborbital bone and the next one above it is also an unreliable character, as these vary greatly, even on the opposite sides of the same fish. (See Gilbert & Starks, Fishes of Panama Bay, Memoir. Cal. Ac. Sci., IV, 1904, p. 70.)

Known from both coasts of tropical America. Our Atlantic coast specimens are from Mindi Cut; Fox Bay, Colon; Colon Reef, and the Colon market. The Pacific coast specimens are from Chame Point; tide streams, Corozal; tide streams, beach and Panama Bay at Balboa, and the Panama City market.

292. Oligoplites refulgens Gilbert & Starks. (Plate XXXIX, fig. 2.)

Oligoplites refulgens Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 73, Pl. XI, fig. 19 (Panama Bay).

Head 3.8 to 4.5; depth 4.0 to 4.6; D. IV or V-I, 19 to 21; A. II-I, 19 or 20.

Body very slender; more elongate than in other species of this genus; dorsal profile evenly convex, not forming an angle at origin of second dorsal; ventral outline a little more strongly rounded than the upper; head rather small, without pores; snout pointed, 3.2 to 4.15 in head; eye 3.35 to 4.6; mouth oblique; lower jaw slightly projecting; maxillary very narrow, reaching slightly past anterior margin of eye to below middle of eye, 2.3 to 2.5 in head; teeth small, present on both jaws, vomer, palatines and tongue, those on jaws in bands, the one on lower jaw much as in *O. altus,* the outer series of very close set, compressed teeth; gill-rakers about two-thirds length of eye, 16 or 17, exclusive of rudiments, on the lower limb of first arch; anterior branchiostegal rays not connected across the isthmus by a membrane; scales long and narrow, as in *O. saliens;* lateral line with a low arch or broad obtuse angle anteriorly; spines of first dorsal connected at base by membranes; second dorsal and anal not greatly elevated anteriorly, the longest rays not reaching past the tips of the succeeding rays when deflexed, the low portion of fins with deep notches between the rays; ventrals inserted about midway between tip of mandible and origin of anal, usually not quite reaching vent; pectorals short, 1.65 to 1.85 in head.

Color dark blue above, sides silvery; the dark blue of the back rather distinctly defined by the silvery of the sides; the body and fins in young often with yellowish green in life; tip of snout and mandible black; dorsal and caudal usually dusky, other fins pale in spirits.

We have 63 small specimens, ranging from 20 to 95 mm. in length, which we refer to this species.

Known from the Pacific coast of Panama to Guayaquil. Our material is from Chame Point and Taboga Island.

113. Genus **Elagatis** Bennett.

Elagatis Bennett, Whaling Voyage, II, 1840, 283 (type *Seriola bipinnulata* Quoy & Gaimard).

Seriolichthys Bleeker, Nat. Tijds. Ned.—Ind., VI, 1854, 196 (type *Seriola bipinnulata* Quoy & Gaimard).

Decaptus Poey, Memorias, II, 1860, 391 (type *Seriola pinnulata* Poey).

Body long and slender, not greatly compressed, the outlines nowhere sharply trenchant; head low; snout long and pointed; premaxillaries protractile; maxillary broad, with a well developed supplemental bone; lateral line with a very low and long arch, forming a slight keel on caudal peduncle, but not armed with bony scutes; second dorsal and anal similar, not greatly elevated anteriorly, *each with a detached finlet;* ventrals rather long; pectorals short.

293. Elagatis bipinnulatus (Quoy & Gaimard).

Seriola bipinnulata Quoy & Gaimard, in Freycinet, Voy. Uranie et Physicienne, Zoöl., 1824, 363, Pl. LXI, fig. 3 (Keeling Island).

Elagatis bipinnulatus Bennet, Whaling Voyage, II, 1840, 283; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 906.

Seriola pinnulata Poey, Memorias, II, 1860, 233 (Havana).

Seriolichthys bipinnulatus Günther, Cat. Fish. Brit. Mus., II, 1860, 468.

Elagatis pinnulatus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 446; Snodgrass & Heller, Proc. Wash. Ac. Sci., VI, 1905, 362.

Head 3.5 to 3.9; depth 4.0 to 4.38; D. V or VI-I, 24 to 26-2; A. I or II-I, 16 to 18-2.

Body elongate, moderately compressed; the back scarcely elevated; profile from snout to dorsal only slightly convex; head rather low; snout long and pointed, 2.7 to 3.4 in head; eye 3.7 to 5; mouth small, nearly horizontal; lower jaw slightly projecting; maxillary broad, with a well developed supplemental bone, failing to reach anterior margin of eye, 2.9 to 3.05 in head; teeth in villiform bands, present on jaws, vomer, palatines and tongue; gill-rakers long and slender, about three-fourths the length of eye, 25 to 27 on lower limb of first arch; scales of moderate size, present on cheeks, the rest of head mostly naked; lateral line with a long, low arch, the scales in posterior part of straight portion slightly thickened, but not developed into bony scutes; first dorsal

with 5 or 6 slender spines, connected by membrane; second dorsal and anal similar in form, the latter, however, much the shorter, each with a single detached finlet, composed of 2 rays; caudal deeply forked; ventrals of moderate size, as long as snout and eye; pectorals short, about 6.6 to 7.75 in body.

Color dark brown. Our small specimen with 2 indistinct, dark bands on sides; the upper one beginning at upper posterior margin of eye and running horizontally to upper margin of caudal peduncle; the lower one beginning at tip of snout, running through lower margin of eye and losing itself above base of anal; fins pale or dusky.

This species is represented by one specimen, 85 mm. in length, in the present collection. It is here described from the above and several larger specimens from New York, Florida and Cuba, ranging in length form 110 to 460 mm.

A pelagic species recorded from all warm seas. Our specimen is from Chame Point.

114. Genus **Seriola** Cuvier.

Seriola Cuvier, Règne Anim., Ed. I, II, 1817, 315 (type *Caranx dumerili* Risso).

Micropteryx Agassiz, in Spix, Pisc. Brasil., 1831, 102 (type *Seriola dumerili* Cuvier).

Zonichthys Swainson, Nat. Hist. & Class. Fish., II, 1839, 248 (type *Scomber fasciatus* Bloch).

Halatractus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 442 (type *Seriola dumerili* Cuvier & Valenciennes; substitute for *Seriola*, used in Botany).

Lepidomegas Thominot, Bull. Soc. Philom. Paris, 7 sér., IV, 1880, 173 (type *Lepidomegas muelleri* Thominot).

Body elongate, moderately compressed; the back not greatly elevated; head rather long; snout more or less conical, not blunt; mouth rather large; premaxillaries protractile; maxillary very broad, with a wide supplemental bone; teeth in broad villiform bands, present on both jaws, vomer, palatines and usually on tongue; lateral line with a long, low arch, unarmed, forming a slight keel on caudal peduncle in adult; first dorsal with 6 to 8 slender spines, connected by membrane; second dorsal long, more or less elevated anteriorly; anal similar to second dorsal, but much shorter; no finlets; ventral fins long; pectorals broad, shorter than ventrals.

KEY TO THE SPECIES.

a. Body deep, strongly compressed, the depth 2.45 to 2.9 in the length.

b. Dorsal and anal anteriorly not notably elevated; gill-rakers about 22. *mazatlana*, p. 395.

bb. Dorsal and anal anteriorly notably elevated, distinctly falcate in adult; gill-rakers 17 or 18. *rivoliana*, p. 396.

aa. Body more elongate, not greatly compressed, its depth 2.95 to 4.2 in its length; dorsal and anal fins anteriorly not much elevated, slightly falcate only in very large examples.

c. Maxillary reaching to or slightly past middle of eye, 2.1 to 2.25 in length of head; gill-rakers rather few, 11 to 14 on lower limb of first arch. *dumerili*, p. 397.

cc. Maxillary shorter, reaching to or slightly past anterior margin of eye, 2.5 to 2.65 in head; gill-rakers more numerous, 19 to 25 on lower limb of first arch. *dorsalis*, p. 398.

294. Seriola mazatlana Steindachner.

Seriola mazatlana Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXIV) Ichth. Beitr., V, 1876, 8 (Mazatlan); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 904.

Head 2.75 to 2.9; depth 2.45 to 2.75; D. VII-I, 31 to 33; A. II, 22.

Body deep, rather strongly compressed; head as deep as long; snout tapering, 4 to 5.25 in head; eye 3 to 3.5; mouth oblique, terminal; maxillary scarcely reaching anterior margin of pupil, 2.4 to 2.6 in head; teeth all small, in villiform bands, present on jaws, vomer, palatines and tongue; gill-rakers slender, about 22 on lower limb of first arch; scales very small, wanting on upper surface of head and snout, present on cheeks; lateral line with a long, low arch anteriorly, more or less wavy, the arched part shorter than the straight portion; first dorsal low, the spines scarcely longer than eye, the soft part about a fourth higher, not elevated anteriorly, the outer margin convex; caudal fin forked; anal fin with 2 short detached spines, the soft part similar to that of the dorsal but notably shorter; ventral fins somewhat longer than the pectorals, inserted just behind base of pectorals; pectoral fins short, the upper rays longest, 1.75 to 2.3 in head.

Color very dark brown, sides with about 10 narrow, vertical bars of lighter brown; a rather indistinct dark bar extending upward and backward from upper posterior margin of eye, meeting its fellow at nape; caudal fin yellowish; pectorals pale; the other fins mostly darker than the body.

The above description is based on 8 small specimens, 22 to 50 mm. long, which we doubtfully refer to this species.

This fish has been reported only from Mazatlan. Representatives of this genus appear to be rare in the Pacific. Our specimens are from Taboga Island and Chame Point. The specimens (6) from the latter locality were sent by Mr. Robert Tweedlie.

295. Seriola rivoliana Cuvier & Valenciennes.

Seriola rivoliana Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 207 (Greek Archipelago); Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 444; Jordan, Proc. U. S. Nat. Mus., 1886, 532; Berg, Anal. Mus. Nac. Buenos Aires, IV, 1895, 34; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 904.

Seriola boscii Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 208 (South Carolina).

Seriola bonariensis Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 211 (Buenos Aires).

Seriola coronata Poey, Memorias, II, 1860, 232 (Cuba).

Zonichthys boscii Gill, Proc. Ac. Nat. Sci. Phila., appendix, 1861, 36.

Halatractus boscii Gill, Proc. Ac. Nat. Sci. Phila., 1862, 442.

Halatractus bonariensis Poey, Syn. Pisc. Cub., 1868, 373.

Halatractus coronatus Poey, Syn. Pisc. Cub., 1868, 373.

Zonichthys coronatus Poey, Enumeratio, 1875, 83.

Head 3.3 to 3.4; depth 2.8 to 2.9; D. VII-I, 28 to 30; A. II-I, 19 to 21.

Body deep, rather strongly compressed; the back considerably elevated; profile from tip of snout to origin of second dorsal evenly convex; ventral outline from tip of mandible to origin of anal nearly straight and horizontal; head rather deep, compressed; snout pointed, 2.7 to 2.8 in head; eye 4.35; mouth of moderate size, slightly oblique; jaws subequal; maxillary very broad, with a large supplemental bone, scarcely reaching middle of eye, 2.3 in head; teeth in broad villiform bands, present on both jaws, vomer, palatines and tongue; gill-rakers long, about two-thirds length of eye, 17 or 18 on lower limb of first arch; scales small, present on cheeks, the rest of head mostly naked; lateral line with a long, low arch, unarmed, but in large examples forming a slight keel on caudle peduncle; first dorsal with 7 rather slender spines, connected by membrane, its origin behind that of pectorals; second dorsal and anal similar in form, the latter, however, much the shorter, each moderately elevated anteriorly, more or less falcate; caudal widely forked; ventrals long, equal to length of eye

and postorbital part of head; pectorals much shorter than ventrals, 5.9 to 6.5 in length of body.

Color plain brownish above, paler below; the dark brown or black band, extending from eye to origin of soft dorsal, which the fish is said to possess, is entirely wanting in the old alcoholic specimens at hand; fins all brownish; dorsal, caudal and anal with a darker margin.

This species was not obtained by us. It is here described from 2 specimens, 90 and 445 mm. in length. The smaller specimen is from Watlings Island and the larger one from Florida.

Known from the Mediterranean, and from the Atlantic coast of America, from South Carolina to Uruguay.

296. Seriola dumerili (Risso).

Caranx dumerili Risso, Ichthyol. Nice, 1810, 175, Pl. VI, fig. 20 (Nice).
Trachurus aliciolus Rafinesque, Caratteri, etc., 1810, 42, Pl. XI, fig. 2 (Sicily).
Seriola dumerili Risso, Hist. Nat. Poiss., III, 1827, 424; Jordan, Proc. U. S. Nat. Mus., 1884, 122 & 123; Jordan & Evermann, Bull, U. S. Nat. Mus., XLVII, 1896, 903.
Seriola lalandi Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 208 (Brazil); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 271, and Bull. U. S. Nat. Mus., XVI, 1883, 444 (part); Jordan, Proc. U. S. Nat. Mus., 1884, 122 & 123; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 903, Pl. CXL, fig. 382.
Seriola dumerilii Günther, Cat. Fish. Brit. Mus., II, 1860, 462.
Seriola lalandii Günther, Cat. Fish. Brit. Mus., II, 1860, 463.
Seriola gigas Poey, Memorias, II, 1860, 227 (Cuba).
Seriola proxima Poey, Memorias, II, 1860, 229 (Cuba).
Zonichthys gigas Poey, Syn. Pisc. Cub., 1868, 371.

Head 3.3 to 3.5; depth 2.95 to 4.1; D. VI to VIII-I, 30 to 36; A. I or II-I, 19 or 20.

Body elongate, compressed; the back more or less elevated; profile from snout to second dorsal gently and about evenly convex; ventral outline anteriorly little curved; head rather deep, compressed; snout tapering, moderately pointed; mouth large, slightly oblique; jaws subequal; maxillary very broad, with a wide supplemental bone, reaching to or slightly past middle of eye, 2.1 to 2.25 in head; teeth in broad villiform bands, present on both jaws, vomer, palatines and tongue; gill-rakers well developed, about two-thirds the length of eye, 11 to 14 on the lower limb of first arch; scales small; present on cheek, the rest of head naked; lateral line with a very long, low arch, unarmed, forming a keel on caudal peduncle in adult; first dorsal with 6 to 8

slender spines, connected by membrane, its origin considerably behind that of pectorals; second dorsal and anal similar in form, the latter, however, much the shorter, each slightly elevated anteriorly, but not falcate, the outer margin of fins not concave except in very large individuals; caudal widely forked, the lobes of about equal length; ventrals long, usually about as long as eye and postorbital part of head; pectorals notably shorter than ventrals, 6.25 to 7.5 in length of body.

Color of the old alcoholic specimens at hand uniform bluish or brownish; without bars or bands.

This species was not taken by us. It is here described from 12 specimens, ranging from 200 to 930 mm. in length. They are from the following localities: Italy, Bahama Islands, Massachusetts, New York, South Carolina and Florida.

A study of the material available in the National Museum indicates that this genus is in need of revision. We have included *S. lalandi* in our synonomy, believing it to be identical with the present species. There is considerable difference in the depth of the body, but this appears to be only an individual variation. It seems probable that the banded forms may yet prove to be the young of this species.

As here understood, this species ranges from the Mediterranean Sea to the West Indies, and on the Atlantic coast of America from Massachusetts to Brazil.

297. Seriola dorsalis (Gill).

Halatractus dorsalis Gill, Proc. Ac. Nat. Sci. Phila., 1863, 84 (Cape San Lucas).

Seriola lalandi Jordan & Gilbert, Proc. U. S. Nat. Mus., 1880, 456 (not of Cuvier & Valenciennes), and Bull. U. S. Nat. Mus., XVI, 1883, 444 (part).

Seriola dorsalis Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 359; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 902, Pl. CXXXIX, fig. 380.

Head 3.5 to 3.95; depth 3.16 to 4.2; D. VI or VII-I, 31 to 35; A. II-I, 20 or 21.

Body elongate, more or less compressed; the back little elevated; profile from snout to second dorsal gently and evenly convex; ventral outline anteriorly little curved; head rather long and low; snout pointed in adult, blunter in young, 2.7 to 3.35 in head; eye 4 to 7.1; mouth rather small, oblique; jaws subequal; maxillary broad, with a wide supplemental bone, reaching to or slightly past anterior margin of pupil, 2.5 to 2.65 in head; teeth in broad villiform bands, present on both jaws, vomer, palatines and tongue; gill-rakers rather strong,

about two-thirds the length of eye, 19 to 22 on lower limb of first arch; scales small, present on cheeks, the rest of head naked; lateral line with a very long, low arch, forming a keel on caudal peduncle in large examples; first dorsal with 6 or 7 slender spines, connected by membrane, its origin considerably behind that of pectorals; second dorsal and anal similar in form, the latter, however, much the shorter, each more or less elevated anteriorly, but not falcate, the outer margin of fins not concave, except in adult; caudal widely forked, the lobes of about equal length; ventrals long, about as long as eye and postorbital part of head; pectorals notably shorter than ventrals, 6.15 to 8.4 in length of body.

Color of alcoholic specimens at hand plain bluish or brownish; young banded in life.

A single, small specimen, 105 mm. long, was sent by Mr. Robert Tweedlie. The species is here described from this specimen, 2 large specimens, 610 and 930 mm. in length, from San Diego, California, and 2 smaller specimens, each 250 mm. long, from Albemarle Island. This species is readily distinguished from *S. dumerili,* the Atlantic form, by the shorter maxillary, and the more numerous gill-rakers.

Known from California southward to the Galapagos Islands.

115. Genus **Naucrates** Rafinesque.

Centronotus Lacépède, Hist. Nat. Poiss., III, 1802, 309 (type *Centronotus conductor* Lacépède; not *Centronotus* of Bloch & Schneider).

Naucrates Rafinesque, Caratteri, etc., 1810, 43 (type *Naucrates fanfarus* Rafinesque = *Gasterosteus ductor* Linnæus).

Pompilus Minding, Lehrb. Nat. Fische, 1832, 108 (type *Gasterosteus ductor* Linnæus).

Nauclerus Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 247 (type *Nauclerus compressus* Cuvier & Valenciennes).

Body elongate, little compressed, the outlines nowhere trenchant; head rather low; snout moderately pointed; premaxillaries protractile; maxillary of moderate width, with a rather narrow supplemental bone; teeth in villiform bands of moderate width, present on both jaws, vomer, palatines and tongue; lateral line scarcely arched, unarmed, but forming a prominent dermal keel on caudal peduncle; first dorsal with 3 or 4 low, stiff spines, separate in adult, connected by membrane only in very young; second dorsal long, anteriorly moderately elevated; anal similar to second dorsal, but much shorter; no finlets; ventrals a little longer than pectorals.

298. Naucrates ductor (Linnæus).

Gasterosteus ductor Linnæus, Syst. Nat., Ed. X, 1758, 295 ("en pelago").

Gasterosteus antecessor Daldorf, Skriv. Nat. Selskab. Kjöb., II, 1793, 166.

Scomber kœlreuteri Bloch & Schneider, Syst. Ichth., 1801, 570.

Centronotus conductor Lacépède, Hist. Nat. Poiss., III 1802, 311.

Naucrates fanfarus Rafinesque, Caratteri, etc., 1810, 44.

Naucrates indicus Lesson, Voy. Coquille, Zoöl., II, 1830, 157 (India).

Naucrates noveboracensis Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 1831, 325 (New York).

Pompilus ductor Minding, Lehrb. Nat. Fische, 1832, 108.

Seriola dussumieri Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 217 (Gulf of Bengal).

Seriola succincta Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 218 (South of St. Helena).

Nauclerus compressus Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 249, Pl. CCLXIII (Molucca).

Nauclerus abbreviatus Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 251 (Atlantic Ocean; misprinted *abreviatus*).

Nauclerus brachycentrus Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 253 (Indian Ocean).

Nauclerus triacanthus Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 253 (Atlantic Ocean).

Nauclerus annularis Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 254 (South of St. Helena).

Nauclerus leucurus Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 255 (South of St. Helena).

Naucrates cyanophrys Swainson, Nat. Hist. & Class. Fish., II, 1839, 412 (Palermo).

Naucrates serratus Swainson, Nat. Hist. & Class. Fish., II, 1839, 413 (Palermo).

Thynnus pompilus Gronow, Cat. Fish, 1854, 123 (Palermo).

Naucrates ductor Günther, Cat. Fish. Brit. Mus., II, 1860, 374; Gill, Proc. Ac. Nat. Sci. Phila., 1862, 440, and Proc. U. S. Nat. Mus., 1882, 490; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 900, Pl. CXXXIX, fig. 379; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 96.

Head 3.35 to 4.05; depth 3.8 to 4.05; D. III or IV-I, 26 to 28; A. II-I, 15 or 16.

Body elongate, somewhat fusiform, little compressed; anterior profile gently convex; ventral outline little curved; head little compressed; snout rather bluntly pointed, 3.45 to 4.2 in head; eye 3.9 to 5.85; mouth moderate, oblique; jaws nearly equal, the lower slightly included; maxillary reaching to or slightly past anterior margin of eye, 2.8 to 3.15 in head; teeth in rather narrow villiform bands, present on both jaws, vomer, palatines and tongue; gill-rakers well developed, about three-fourths the length of eye, 15 to 17 on the lower limb of first arch; scales small, present on cheeks, the rest of head mostly naked; lateral line scarcely arched, forming a well developed keel on caudal peduncle; first dorsal with 3 or 4 very short spines, connected by membrane in very young only; second dorsal and anal similar in form, the latter, however, much the shorter, each more or less elevated anteriorly, but not falcate; caudal broadly forked, the lobes of equal length; ventrals nearly as long as eye and postorbital part of head; pectorals a little shorter than ventrals, 6.15 to 7.2 in length of body.

Color of adult in spirits uniform brownish above, pale or silvery below; young with 6 distinct cross-bands, extended on vertical fins; caudal with a black blotch at base and a black bar on the lobes; ventrals largely black.

This species was not taken by us. It is here described from specimens from Italy, Cuba and Woods Hole, ranging in length from 100 to 345 mm. We have also examined 2 small specimens, 35 and 65 mm. in length, from the Pacific (Albatross stations 4703, Lat. 17° 18.6′ S; Long. 100° 52.3′ W., and 4704, Lat. 16° 55.3′ S.; Long. 100° 24.6′ W.). These small specimens were provisionally identified by Kendall & Radcliffe, 1912, as this species. We are able to verify this identification with a degree of certainty. The young appear to be deeper and more strongly compressed than the adult.

A pelagic species, known from all warm seas.

Family XLV. **Pomatomidæ.**

The Bluefishes.

Body oblong, compressed; head large; mouth large, oblique; premaxillaries protractile; maxillary not slipping under preorbital, with large supplemental bone; lower jaw projecting; jaws each with a series of strong, compressed, unequal, widely set teeth; upper jaw with an inner series of small depressed teeth; villiform teeth on vomer, palatines and tongue; gill-membranes free from isthmus, not united; gills 4, a slit behind the fourth; branchiostegals 7; gill-rakers slender,

rather few; opercle ending in a flat point; preopercular margin serrate; lateral line present, unarmed; scales rather small, weakly ctenoid, present on cheeks and opercles, also on soft dorsal and anal; dorsal fins 2, the first with about 8 weak spines, connected by membrane, depressible into a groove; caudal fin forked; anal fin similar to soft dorsal, preceded by 2 very small free spines; ventrals thoracic, I, 5; pectorals rather short. A single widely distributed species is known.

116. Genus **Pomatomus** Lacépède.

Pomatomus Lacépède, Hist. Nat. Poiss., IV, 1803, 435 (type *Pomatomus skib* Lacépède=*Perca saltatrix* Linnæus).

Gonenion Rafinesque, Caratteri, etc., 1810, 53 (type *Gonenion serra* Rafinesque=*Perca lophar* Forskål).

Lopharis Rafinesque, Caratteri, etc., 1810, 52 (type *Perca lophar* Forskål).

Temnodon Cuvier, Règne Animal, Ed. I, II, 1817, 346 (type *Cheilodipterus heptacanthus* Lacépède).

Sparactodon Rochebrune, Bull. Soc. Philom. Paris, 7 sér., IV, 1880, 162 (type *Sparactodon nalnal* Rochebrune).

Characters of the genus are included in the family description.

299. Pomatomus saltatrix (Linnæus).

Perca saltatrix Linnæus, Syst. Nat., Ed. X, 1758, 293 (Carolina).

Gasterosteus saltatrix Linnæus, Syst. Nat., Ed. XII, 1766, 491.

Pomatomus skib Lacépède, Hist. Nat. Poiss., IV, 1803, 436 (Carolina).

Temnodon saltator Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 225, Pl. CCLX.

Chromis epicurorum Gronow, Cat. Fish, 1854, 149 (Carolina).

Pomatomus saltator Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 448.

Pomatomus saltatrix Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 914; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 946, Pl. CXLVII, fig. 400.

Head 3.3; depth 4; D. VIII-I, 25; A. II-I, 26; scales 95.

Body elongate, robust, moderately compressed; head deep; snout pointed, about twice the length of eye; eye rather small, about 8 in head, depending much upon the size of the fish, the eye being proportionately much larger in the young than in adult; cheeks much longer than opercles; mouth large, oblique; maxillary reaching beyond eye, at least in adult, about 2.3 in head; scales rather small, weakly

ctenoid; dorsal fins separate, the first dorsal with 8 short weak spines; the second dorsal anteriorly somewhat elevated, the longest rays about twice as high as the longest spines, its outer margin broadly concave; caudal fin forked; anal fin preceded by 2 weak, separate spines, the soft part similar to that of the dorsal; ventral fins small, inserted under base of pectorals; pectoral fins short, about 2 in head.

Color green above and silvery below; a blackish blotch at base of pectoral.

This widely distributed fish was not taken by us. It reaches a large size, one meter or more in length, and is an excellent food fish. It is voracious and very destructive to other fish.

Known from the Atlantic and Indian oceans; on the American coast from Maine to Argentina.

Family XLVI. **Rachycentridæ.**

The Sergeant-fishes.

Body elongate, nearly fusiform; head broad, strongly depressed, the bones above appearing through the skin; mouth wide, nearly horizontal; lower jaw projecting; premaxillaries not protractile; maxillaries reaching about to anterior margin of eye; teeth small, pointed, in bands on jaws, vomer, palatines and tongue; opercle and preopercle unarmed; branchiostegals 7; gill-rakers short and rather strong; first dorsal with 8 or 9 short, free spines, depressible in a groove; second dorsal and anal long and rather low, not much elevated anteriorly, without falcate lobes; caudal truncate in young, forked in adult; ventrals thoracic, I, 5; pectorals moderate, placed below level of lower margin of eye; vertebræ 12 + 13 = 25.

117. Genus **Rachycentron** Kaup.

Rachycentron Kaup, Isis, XIX, 1826, 89 (type *Rachycentron typus* Kaup).

Rachycentrum Kaup, Isis, XX, 1827, 624, amended spelling.

Elacate Cuvier, Règne Animal, Ed. II, II, 1829, 203 (type *Elacate motta* Cuvier & Valenciennes).

Characters of genus included in family description.

300. Rachycentron canadus (Linnæus).

Gasterosteus canadus Linnæus, Syst. Nat., Ed. XII, 1766, 491 (Carolina).

Scomber niger Bloch, Naturg. Ausl. Fische, VII, 1793, 57, Pl. CCCXXXVII (Southern Seas between Africa and America).

Centronotus gardenii Lacépède, Hist. Nat. Poiss., III, 1802, 318 (Carolina).

Centronotus spinosus Mitchill, Trans. Lit. & Phil. Soc. N. Y., I, 1815, 490, Pl. III, fig. 9 (New York).

Elacate pondiceriana Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 1831, 329 (Pondicherry).

Elacate motta Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 1831, 332 (Orixa).

Elacate malabarica Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 1831, 332 (Malabar).

Elacate atlantica Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 1831, 334, Pl. CCXXXIII (Brazil); De Kay, Fauna N. Y., Fishes, 1842, 113, Pl. XXV, fig. 77.

Elacate bivittata Cuvier & Valenciennes, Hist. Nat. Poiss., VIII, 1831, 338 (Molucca).

Elacate falcipinnis Gosse, Naturalists' Sojourn in Jamaica, 1851, 208 (Jamaica).

Elacate niger Günther, Cat. Fish. Brit. Mus., II, 1860, 375.

Elacate canada Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 418.

Rachycentron canadus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 948, Pl. CXLVIII, fig. 401.

Head 4.05 to 5.3; depth 5.55 to 8.1; D. VIII or IX-I, 28 to 33; A. I, 23 to 26.

Body very elongate, somewhat fusiform; head very long, much depressed; snout broad, its length 2.45 to 2.85 in head; eye 4.85 to 6.35; mouth moderate; the lower jaw projecting; maxillary reaching anterior margin of eye, 2.3 to 2.6 in head; teeth small, in bands on both jaws, vomer, palatines and tongue; gill-rakers short, 7 to 9 on lower limb of first arch; lateral line continuous, more or less wavy; scales minute, covering entire body, also present on cheeks; first dorsal with 8 or 9 very short, stiff spines; second dorsal long, anteriorly only slightly elevated, not forming a lobe; anal similar to second dorsal, but shorter; caudal truncate in young, slightly forked in adult; ventrals moderate, as long as postorbital part of head; pectorals large, not much shorter than head in adult, 1.1 to 1.3 in length of head.

Color dark brown above, a paler brown on sides and below; a black lateral band, wider than eye, extending from snout to base of caudal; ventral surface of head pale; fins mostly black.

Only one specimen of this species, 215 mm. in length, was secured. We have compared it with specimens from New Jersey, Maryland, Virginia and North Carolina, with which it essentially agrees. The above description is based on 10 specimens ranging in length from 95 to 440 mm.

This species is widely distributed, inhabiting warm seas. It occurs on the Atlantic coast from Cape Cod southward to Brazil. It is as yet not recorded from the Pacific coast of America. Our specimen is from Mindi Cut, Canal Zone.

Family XLVII. **Coryphænidæ.**

The Dolphins.

Body elongate, compressed; mouth wide, oblique; the lower jaw projecting; teeth small, present on jaws, vomer, palatines and tongue; opercle and preopercle entire (except in very young); gill-membranes free from the isthmus; branchiostegals 7; pseudobranchiæ wanting; lateral line present; scales very small, cycloid; dorsal fin long and low, with many rays, extending from nape nearly to caudal fin; anal similar, but shorter; caudal fin forked; ventrals well developed, thoracic, I, 5; pectorals small.

118. Genus **Coryphæna** Linnæus.

Coryphæna Linnæus, Syst. Nat., Ed. X, 1758, 261 (type *Coryphæna hippurus* Linnæus).

Caranxomorus Lacépède, Hist. Nat. Poiss., III, 1802, 82 (type *Scomber pelagicus* Linnæus).

Lepimphis Rafinesque, Caratteri, etc., 1810, 33 (type *Lepimphis hippuroides* Rafinesque).

Lampugus Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 317 (type *Scomber pelagicus* Linnæus).

Ectenias Jordan & Thompson, Memoir. Carneg. Mus., VI, 1914, 241 (type *Ectenias brunneus* Jordan & Thompson).

Characters of the genus are included in the family description. A large number of species have been named which have, however, been reduced to two by recent authors. The multiplication of the nominal species appears to be due to the variation in color and the variation in structure with age. A single species is represented in the Panama collection.

301. Coryphæna hippurus Linnæus.

Coryphæna hippurus Linnæus, Syst. Nat., Ed. X, 1758, 261 (open seas); Lütken, (Dan. Vid. Selsk. Skr., 5 ser., XII) Spolia Atlantica, 1880, 483, Pl. III, figs. 12 & 13; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 952, Pl. CXLIX, fig. 402.

Scomber pelagicus Linnæus, Syst. Nat., Ed. X, 1758, 299.

Coryphæna immaculata Agassiz, in Spix, Pisc. Brasil., 1831, 111, Pl. LVI (Atlantic, off Brazil).

Coryphæna marcgravii Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 301 (South America).

Coryphæna sueurii Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 302 (Philadelphia).

Coryphæna dorado Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 303 (Brazil).

Coryphæna dolfyn Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 305 (Antilles).

Coryphæna virgata Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 308 (Martinique).

Head 3.75 to 3.85; depth 5 to 6.3; D. 55 to 60; A. 26 to 29.

Body elongate, tapering posteriorly, moderately compressed; head large, rather broad; snout moderately acute, 3.95 to 4.35 in head; eye rather large, 2.65 to 3 in head; interorbital broad, flat, wider than eye; mouth large, oblique, terminal; maxillary reaching vertical from middle of eye, 2.15 to 2.45 in head; teeth small, in bands on anterior part of each jaw, reduced to a single irregular series posteriorly; vomer, palatines and tongue with bands of villiform teeth; preopercle with a few rather prominent spines at angle in very young (25 mm.), disappearing early (wanting in specimens 50 mm. long); gill-rakers slender, 8 to 10 on lower limb of first arch; scales minute; lateral line anteriorly with a short abrupt arch; dorsal fin very long, its origin over or a little in advance of preopercular margin; caudal fin forked, the lobes equal; anal fin similar to the dorsal but its base only about half as long; ventral fins notably longer than pectorals, inserted under base of pectorals; pectorals short, 1.8 to 2 in head.

Color in alcohol very dark brown. The largest specimens in the present collections are of nearly uniform color, lighter cross-bars being only faintly visible on back, represented on sides by pale dots; these markings are much more distinct in the small specimens. Dorsal fin paler brown than the back, with a series of dark spots at base, these extending upward on fins; caudal fin dark brown at base, the tips

pale; anal and ventrals very dark, the outer rays of ventrals and the distal part of anterior rays of anal pale; pectorals colorless.

The above description is based on 36 young specimens, ranging in length from 23 to 75 mm., which were sent by Mr. Robert Tweedlie.

Known from the Atlantic and Pacific oceans. The species previously was not recorded from the coasts of Panama. Our specimens are from Chame Point on the Pacific Coast.

Family XLVIII. **Stromateidæ.**

The Harvest-fishes.

Body compressed; the back more or less elevated; anterior profile blunt and rounded; premaxillaries not protractile; opercle smooth; preopercle entire or serrate; gill-membranes either separate and free, or broadly joined to the isthmus; pseudobranchiæ present; gills 4, a slit behind the fourth; teeth wanting on vomer and palatines; pharyngeals little developed; œsophagus armed with numerous horny, barbed, or hooked teeth; lateral line well developed; scales small or minute, cycloid, covering entire body and cheeks; dorsal fin single, long, with the spines few or weak, often obsolete; anal fin long, similar to dorsal, usually with 3 spines; ventrals thoracic, I, 5 in young, reduced or altogether wanting in adult; caudal fin well forked; air bladder usually wanting; vertebræ 30 to 36.

KEY TO THE GENERA.

a. Ventral fins present in the adult as well as in the young; dorsal spines 7 to 11.

b. Body elongate, the depth more than 3 in the length; teeth on vomer and palatines. *Nomeus,* p. 407.

bb. Body short and deep, the depth usually less than 2.5 in the length; no teeth on the palatines. *Psenes,* p. 409.

aa. Ventral fins absent in adult; dorsal spines 3; the soft dorsal and anal anteriorly much elevated. *Peprilus,* p. 410.

119. Genus **Nomeus** Cuvier.

Nomeus Cuvier, Règne Animal, Ed. I, II, 1817, 315 (type *Gobius gronovii* Gmelin).

Body oblong, moderately compressed; head and body covered with small, cycloid scales; mouth small; maxillaries entirely concealed when the mouth is closed; premaxillaries feebly protractile; teeth on vomer

and palatines; opercular bones thin, entire; gill-membranes not united, free from the isthmus; gill-rakers of moderate length; branchiostegals 6; lateral line running high, concurrent with the dorsal profile; dorsal spines 10 or 11; anal spines 3, the fin similar to soft dorsal; caudal fin forked; ventrals well developed, attached to the abdomen by membrane, depressible in a deep furrow; pectorals long; air-bladder present; vertebræ about 41.

302. Nomeus gronovii (Gmelin).

Gobius gronovii Gmelin, Syst. Nat., I, 1789, 1205 (tropical America).

Gobiomorus gronovii Lacépède, Hist. Nat. Poiss., II, 1800, 584.

Eleotris mauritii Bloch & Schneider, Syst. Ichth., 1801, 66 (Brazil).

Nomeus maculosus Bennett, Proc. Zoöl. Soc. London, 1831, 146 (East Indies).

Nomeus gronovii Günther, Cat. Fish. Brit. Mus., II, 1860, 387; Eigenmann, Ann. N. Y. Ac. Sci., VII, 1894, 629 (Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 948.

Nomeus oxyurus Poey, Memorias, II, 1860, 236 (Havana).

Head 3.4; depth 3.8; D. X or XI-I, 25 to 27; A. III, 25 to 27; scales 64 to 66.

Body compressed, the dorsal and ventral outlines about evenly curved, the depth greater in the young than in the adult; snout blunt, 4.2 in head; eye 3.2; mouth rather small, terminal; maxillary reaching vertical from anterior margin of eye, 1.2 in head; dorsal fin long, deeply notched to nearly divided, the longest spines scarcely higher than the longest soft rays; caudal fin forked, the lobes of about equal length; anal fin preceded by 3 connected spines, the soft part of fin rather low, not elevated anteriorly, the margin convex, similar to the soft dorsal and opposite it; ventral fins large, fan-shaped, inserted under the base of the pectorals; pectoral fins rather small, shorter than ventrals.

Color light brown above, silvery below; sides with large brown spots; anal with 3 or 4 brown spots; ventrals black with silvery margin; pectorals brown above, white below.

This fish was not taken by us. The above description is compiled from published accounts.

Known from the tropical parts of the Atlantic and Pacific oceans. Once recorded from the Pacific coast of Panama by Prof. C. H. Eigenmann. It has not been seen there by other investigators.

120. Genus **Psenes** Cuvier & Valenciennes.

Psenes Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 259 (type *Psenes cyanophrys* Cuvier & Valenciennes).

Body rather short and deep, strongly compressed; snout short and swollen; mouth small; no teeth on tongue and vomer in young; scales of moderate size, cycloid; dorsal with 9 to 11 spines; second dorsal and anal long and similar; anal spines 3, not separate from the soft part; ventral fins inserted under the base of pectorals.

303. Psenes pacificus sp. nov. (Plate XL.)

Type No. 82196, U. S. N. M.; length 31 mm.; Chame Point, Panama.

Head 2.35 to 2.7; depth 1.6 to 1.85; D. IX-I, 26 to 28; A. III, 26 or 27; scales about 55 to 58.

Body short, compressed; the anterior profile rather steep, convex; head deeper than long; snout blunt, rather broad, 5.25 to 5.85 in head; eye 2.4 to 2.9; interorbital broader than eye, convex; mouth rather small, inferior, a little oblique; maxillary reaching slightly beyond anterior margin of pupil, 2.9 to 3.4 in head; preopercular margin entire; gill-membranes separate, free from the isthmus; lateral line concurrent with the back; head with many mucus pores; scales rather large, adherent, cycloid, wanting only on chin, snout and interorbital region; dorsal fin long, nearly or quite separated, the third and fourth spines highest, about as long as the longest soft rays, its origin slightly in advance of margin of opercle; caudal fin forked, the lobes of equal length; anal fin with 3 spines, all connected with each other and with the soft part of the fin by membrane, highest anteriorly, with convex margin, the soft part similar to that of the dorsal and opposite it; ventral fins moderate, inserted under base of pectorals, scarcely shorter than pectorals; pectoral fins rather short, 1.35 to 1.6 in head.

Color dark brown; sides with slightly darker blotches, forming indefinite vertical bars, and faint indications of dark lines along the rows of scales; snout, chin and chest with large punctulations; dorsal and anal brownish, punctulate; caudal fin paler, with fewer punctulations; ventral fins black; pectoral fins plain translucent.

The foregoing description is based on 3 small specimens, respectively 23, 31 and 33 mm. in length, sent by Mr. Robert Tweedlie from Chame Point. This appears to be the first time that representatives of this genus have been taken on the Pacific coast of tropical America. Our specimens appear to be rather close to *P. cyanophrys,* but they have 9 spines instead of 10 in the first dorsal; the mouth is inferior,

the lower jaw being shorter than the upper; and the snout is very blunt and much shorter than the eye.

121. Genus **Peprilus** Cuvier.

Rhombus Lacépède, Hist. Nat. Poiss., II, 1800, 321 (type *Chætodon alepidotus* Linnæus; name preoccupied).

Peprilus Cuvier, Règne Animal, Ed. II, II, 1829, 213 (type *Peprilus crenulatus* Cuvier).

**Palometa* Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 965, and 1898, 2849 (type *Palometa palometa* Jordan & Bollman).

Body ovate or more or less elongate, strongly compressed; head short, compressed; snout short and blunt; mouth small; jaws subequal; premaxillaries not protractile; opercle and preopercle entire; teeth small, present on jaws only, in a single series; gill-membranes separate, free from the isthmus; gill-rakers short or of moderate length; lateral line high, following the curvature of the back, without scutes or keel on caudal peduncle; scales small, cycloid, rather loosely attached; very small scales covering the dorsal and anal, and sometimes the caudal fin; pectorals usually without scales; dorsal and anal similar, more or less elevated anteriorly, each preceded by about 3 indistinct spines and a procumbent spine with a free point both anteriorly and posteriorly; caudal deeply forked, the lobes long and slender; ventrals wanting, represented by a single short spine attached to the pubic bone; pectorals long and narrow.

KEY TO THE SPECIES.

a. Body deep, ovate, the depth usually less than 2 in the length; snout extremely short, notably shorter than eye.

b. Anal fin long, with III, 37 to 45 rays.

c. Body very short and deep, rather robust, its depth 1.46 to 1.5 in its length; head extremely short and deep, the anterior profile steep and very strongly convex; mouth very small, the maxillary reaching anterior margin of eye, 3.54 to 3.75 in head; anal with III, 37 or 38 rays. *paru*, p. 411.

cc. Body more elongate, and more strongly compressed, its depth 1.63 to 2.0 in its length; head longer, the anterior profile more gently convex; mouth slightly larger, the maxillary reaching past anterior margin of eye, 3.1 to 3.46 in head; anal with III, 41 to 45 rays. *palometa*, p. 412.

*According to Jordan (Genera of Fishes, Part IV, 1920, p. 474) *Palometa* should stand as a distinct genus.

bb. Anal fin short, with III, 32 rays. *medius*, p. 413.

aa. Body much more elongate, its depth 2.5 in its length; snout longer, about as long as eye. *snyderi*, p. 413.

304. Peprilus paru (Linnæus).

Stromateus paru Linnæus, Syst. Nat., Ed. X, 1758, 248 (Jamaica); Lütken, (Dan. Vid. Selsk. Skr., 5 ser., XII) Spolia Atlantica, 1880, 522, Pl. III, fig. 16 (in part); Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 914.

Stromateus gardenii Günther, Cat. Fish. Brit. Mus., II, 1860, 399 (in part).

Stromateus alepidotus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 451 (in part).

Rhombus paru Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 965, and 1898, 2849, Pl. CL, fig. 404 (in part).

Peprilus paru Evermann & Marsh, Bull. U. S. Fish Comm., XX, Pt. I, 1900 (1902), 141 (in part).

Seserinus paru Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 402 (Colon).

Head 3.8 to 4.25; depth 1.46 to 1.5; D. III, 41 to 43; A. III, 37 or 38.

Body short and deep, compressed, more robust than in related species; the back elevated; anterior profile steep, strongly convex; head short and deep; snout extremely short and blunt, its length 5.45 to 7.1 in head; eye 2.85 to 3.0; mouth small; jaws equal; maxillary reaching anterior margin of eye, 3.54 to 3.75 in head; teeth present on jaws only, small, in a single close set series; gill-rakers short and feeble, 14 or 15 on lower limb of first arch; lateral line high, following the curvature of the back; scales rather large, covering entire body and most of head; pectorals wtih few scales, other fins densely scaled to their tips; dorsal and anal fins similar, elevated anteriorly, falcate, the produced lobe of the anal longer than that of the dorsal; pectorals longer than head, 2.3 to 3.25 in length of body.

Color in spirits plain bluish above, silvery below.

This species was not taken by us. Here described from two specimens, one 210 mm. long, from Jamaica, and the other, 170 mm. long, from Rio de Janeiro.

Known from Jamaica to Brazil. Apparently differing from *P. alepidotus* of our south Atlantic coast in the more robust body, larger scales, in the much more numerous scales on the fins, and in the slightly shorter anal fin.

305. Peprilus palometa (Jordan & Bollman).

Stromateus palometa Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 156 (off coast of Colombia, Lat. 8° 16′ 30″ N., Long. 79° 37′ 45″ W.; Albatross Sta. 2804).

Rhombus palometa Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 966.

Palometa palometa Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2849.

Peprilus palometa Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 85 (Panama Bay).

Head 2.94 to 3.85; depth 1.63 to 2.0; D. III, 43 to 46; A. III, 41 to 45.

Body deep, ovate, strongly compressed; the back elevated; anterior profile moderately convex; head short and deep; snout extremely short and blunt, 4.7 to 5.4 in head; eye 3.25 to 3.5; mouth rather small, oblique; jaws equal; maxillary scarcely reaching anterior margin of pupil, 3.1 to 3.46 in head; teeth small, present on jaws only, in a single close set series; gill-rakers short and feeble, 14 to 17 on lower limb of first arch; lateral line rather high, following the curvature of the back; scales small, covering entire body and the cheeks and preopercles; pectorals and caudal with few scales or none; other fins covered with very small scales; dorsal and anal similar, elevated anteriorly, falcate, the produced lobe of the anal longer than that of the dorsal; pectorals very long in adult, much longer than head, shorter in young, 2.2 to 3.5 in length of body.

Color bluish above, silvery, with more or less dusky below; fins all black or dusky; with numerous black points.

We have 8 specimens of this species, ranging from 180 to 225 mm. in length. Besides these we examined several small specimens taken at the Galapagos Islands by the "Albatross." This fish is close to *P. alepidotus* of the southern Atlantic coast of the United States, but differs in the more elongate body, the less convex anterior profile, somewhat larger mouth, and in the much shorter dorsal and anal lobes.

Known from the Pacific coast of Panama south to off the coast of Colombia, Lat. 8° 16′ 30″ N., Long. 79° 37′ 45″ W., where the type was taken. Our specimens are all from the Panama City market.

306. Peprilus medius (Peters).

Stromateus medius Peters, Monatsb. k. Ak. Wiss. Berlin, 1869, 707 (Mazatlan); Jordan, Proc. Ac. Nat. Sci. Phila., 1883, 284.

Rhombus medius Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 967.

Peprilus medius Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 88.

Head 3.5; depth 1.9; D. III, 42; A. III, 32.

Body broad, ovate; fins distinctly punctulate.

This species was not seen by us. It was once recorded from Panama, this record being based upon specimens which were destroyed by fire. Gilbert & Starks (1904, p. 88) have the following to offer in regard to this record: "The Panama record of this species needs verification. The specimens obtained may have belonged to one of the forms above recorded (*P. palometa, P. snyderi*), both of which were unknown. Only the type of *P. medius* from Mazatlan is now extant."

307. Peprilus snyderi Gilbert & Starks.

Peprilus snyderi Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 87, Pl. XII, fig. 23 (Panama Bay).

Body more elongate than in related species, compressed; the back not greatly elevated; dorsal and ventral outlines similarly curved; the anterior profile moderately convex; head large; snout blunt, of moderate length, as long as eye, 4.25 in head; mouth small; jaws equal; maxillary reaching slightly past anterior margin of eye, 3.4 in head; teeth small, present on jaws only, in a single close set series; gill-rakers slender, of moderate length, 15 on lower limb of first arch; lateral line running rather high, following the curvature of the back; scales of moderate size, covering entire body, also present on cheeks and upper part of opercles; pectorals without scales; other fins with very small crowded scales, extending nearly or quite to the tips of the rays; dorsal and anal similar, moderately elevated anteriorly, the lobe of the anal slightly longer than that of the dorsal; pectorals longer than head, 2.95 in length of body.

Color bluish brown above, silvery below; fins all brown or dusky; pectoral with numerous dark points, its base brownish.

This species was not taken by us. It is here described from a single specimen, a paratype, 249 mm. in length.

Known only from the Pacific coast of Panama, where it was taken by Dr. Gilbert and his party in 1896.

Family XLIX. Apogonidæ.*

The Cardinal-fishes.

Body oblong or elongate; mouth large, oblique; preopercle with two ridges, its edge entire or serrate; opercle with a spine behind, usually little developed; branchiostegals 6 or 7; teeth villiform, present on jaws, vomer and sometimes on palatines; canines occasionally present; lower pharyngeals separate, with sharp teeth; scales rather large, striated and ctenoid, occasionally cycloid; lateral line complete; dorsal fins well separated, the first with 6 to 9 rather strong spines; no dorsal sheath or furrow; anal fin short, usually with 2 spines, occasionally with 3 or 4; ventral fins thoracic, with I, 5 rays, without an axillary scale.

122. Genus **Apogon** Lacépède.

Amia Gronow, Zoophyl., 1763, 80 (type *Apogon moluccensis* Cuvier & Valenciennes) (non-binomial).

Apogon Lacépède, Hist. Nat. Poiss., III, 1802, 411, (type *Apogon ruber* Lacépède).

Ostorhinchus Lacépède, Hist. Nat. Poiss., IV, 1803, 23, (type *Ostorhinchus fleurieu* Lacépède).

Dipterodon Lacépède, Hist. Nat. Poiss., IV, 1803, 165 (type *Dipterodon hexacanthus* Lacépède).

Monoprion Poey, Memorias, II, 1860, 123, (type *Monoprion maculatus* Poey).

Body oblong, compressed; head large; mouth wide, oblique; maxillary extending below middle of large eye; preopercle with a double ridge, its edge somewhat serrate, at least in young; opercle with a single spine behind; villiform teeth present on jaws, vomer and palatines; no canines; gill-rakers long; scales large, ctenoid; first dorsal with 6 or 7 strong spines; second dorsal remote, short; anal with 2 spines and 8 or 9 soft rays, the soft portion similar to that of the dorsal; pectorals and ventrals moderate.

key to the species.

a. Base of second dorsal with a saddle-like black blotch or with a band; another blotch on caudal peduncle above; no caudal spot.

b. Base of second dorsal with a saddle-like black blotch extending downward to lateral line; body short and deep, the depth 2.6 to 2.9 in length; pectoral fins moderate, reaching to or slightly past origin of anal, 1.4 to 1.6 in head. *maculatus*, p. 415.

*This family is given under the name *Cheilodipteridæ* in the "Key to the Families" in Part I, p. 23, of the present work.

bb. Base of second dorsal with a narrow black band uniting its last rays with those of the anal; body more elongate, the depth 3.0 in length; pectoral fins long, reaching past anterior third of base of anal, 1.6 in head. *binotatus,* p. 416.

aa. Base of second dorsal without a black blotch or band; no saddle-like blotch on caudal peduncle above; base of caudal with a more or less distinct blackish spot or vertical band.

c. Color pale in spirits, bright red in life; head and scales mostly with dusky punctulations; base of caudal with a roundish black spot; snout of moderate length, 4.2 to 5.3 in head; second dorsal high, nearly as long as head without snout; scales 23 to 25. *dovii,* p. 417.

cc. Color brownish; head with black specks; scales mostly with clusters of brownish punctulations; base of caudal with an oblong vertical bar or band; snout very short and blunt, 5.0 to 5.85 in head; second dorsal moderate, its longest rays equal to postorbital part of head and half the eye; scales 21 to 23. *pigmentarius,* p. 418.

308. Apogon maculatus (Poey).

Monoprion maculatus Poey, Memorias, II, 1860, 123 (Cuba).

Amia maculata Poey, Syn. Pisc. Cub., 1868, 304.

Apogon maculatus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 279; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1109.

Head 2.5 to 2.85; depth 2.6 to 2.9; D. VI-I, 9; A. II, 8; scales 23 to 25.

Body rather short and deep, compressed; dorsal and ventral profiles about evenly rounded; caudal peduncle long, much compressed, its depth 2.3 to 2.75 in head; head large, compressed; interorbital space narrower than eye, 4.0 to 4.9 in length of head; snout rather blunt, shorter than eye, 4 to 5.8 in head; eye 2.7 to 3.26; mouth large, slightly subinferior; the maxillary not quite reaching posterior margin of eye, 1.7 to 2.0 in head; opercle with a stiff spine; preopercle rather strongly serrate; gill-rakers shorter than pupil, 13 or 14, including rudiments, on lower limb of first arch; pseudobranchiæ well developed; scales large, ctenoid; lateral line complete, following the outline of the back; first dorsal rather low, the longest spine equal to postorbital part of head; second dorsal higher, the longest rays equal to postorbital part of head and half the eye; caudal fin emarginate, the upper lobe the longer, somewhat pointed, the lower lobe round; anal fin similar to

second dorsal, but not quite as high, its longest rays slightly shorter than snout and eye; ventral fins inserted below base of pectorals, reaching slightly past vent; pectoral fins rather long, reaching to or slightly past origin of anal, 1.4 to 1.6 in head.

Color in life bright red; opercle with a black blotch; a saddle-like blotch under base of the posterior rays of the dorsal, which extends downward to lateral line; a second saddle on caudal peduncle; fins all bright red in life, plain in spirits.

We have 7 specimens of this species, ranging in length from 45 to 90 mm.

Known from Florida to Brazil. Our specimens are from Toro Point and Colon; all were taken on coral reefs.

309. Apogon binotatus (Poey).

Amia binotata Poey, Repertorio, II, 1867, 234 (Cuba).

Apogon binotatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1109.

Head 2,58; depth 3.0; D. VI-I, 9; A. II, 8; scales 23.

Body much compressed, but rather more elongate than in related species; dorsal profile anteriorly nearly straight; ventral profile with a more or less distinct angle at articulation of mandible; caudal peduncle very long, compressed, its depth 2.75 in head; head large, compressed; interorbital space narrower than the large eye, 5.0 in length of head; snout short and blunt, 4.6 in head; eye 2.9; mouth large, terminal; the maxillary reaching slightly past posterior margin of eye, 1.85 in head; opercle with a stiff spine; preopercle distinctly serrate; gill-rakers slightly shorter than pupil, 15, including rudiments, on lower limb of first arch; pseudobranchiæ well developed; scales large, ctenoid; lateral line complete, closely following the outline of the back; first dorsal rather low, the longest spine equal to postorbital part of head; second dorsal high, its longest rays equal to postorbital part of head and two-thirds of eye; caudal fin emarginate, both lobes round, the upper much the larger; anal similar to the dorsal, but lower, the longest rays equal to length of snout and eye; ventral fins inserted in advance of pectorals, not quite reaching origin of anal; pectorals long, reaching past anterior third of base of anal, 1.6 in head.

Color red in life, mostly pale in spirits; head and scales above and on sides with dusky punctulations; a narrow black band uniting the last rays of the dorsal with those of the anal, a wider one on caudal peduncle; fins plain.

This species is represented by a single specimen, 93 mm. long, in the present collection, which forms the basis for the above description. It differs from *A. maculatus* in the more slender body, larger eye, more anterior position of the ventrals, longer pectoral fins and in color.

Heretofore known only from Cuba. Our specimen is from Porto Bello.

310. Apogon dovii Günther.

Apogon dovii Günther, Proc. Zoöl. Soc. London, 1861, 371 (Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1108; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 88 (Panama).

Amia dovii Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 103.

Head 2.5 to 2.7; depth 2.7 to 3.2; D. VI-I, 9; A. II, 8; scales 23 to 25.

Body rather short, compressed; ventral profile anteriorly more convex than the dorsal; caudal peduncle long, strongly compressed, its depth 2.2 to 2.7 in head; head large, compressed; interorbital space narrow, 4.2 to 4.9 in length of head; snout blunt, shorter than the large eye, 4.2 to 5.3 in head; eye 2.45 to 3; mouth large, subinferior; the maxillary reaching posterior margin of eye, 1.75 to 1.9 in head; opercle with a stiff spine; preopercle weakly serrate; gill-rakers not much longer than pupil, 13 or 14, including rudiments, on lower limb of first arch; pseudobranchiæ well developed; scales large, ctenoid; lateral line complete, closely following the outline of the back; first dorsal rather low, the longest spine equal to postorbital part of head; second dorsal rather high, the longest rays only slightly shorter than head without snout; caudal fin emarginate, the lobes round, the upper much the larger; anal fin small; ventral fins inserted slightly in advance of the pectorals, usually reaching origin of anal; pectorals long, reaching past origin of anal, 1.2 to 1.57 in head.

Color of body and fins bright red in life; base of caudal with a black blotch, somewhat larger than the pupil; this spot very distinct in young, occasionally becoming faint in large examples; head densely punctulate with brown; scales mostly with dusky punctulations; tips of second dorsal, caudal and anal dusky.

This species is represented by 145 specimens, ranging in length from 35 to 95 mm. We have compared our specimens with a large series of *A. retrosella* from San Benito Id. The latter seems to differ

mainly in color, and the average number of scales in the lateral series apparently runs a little lower.

Known from Mazatlan to Panama. Our material is from Taboga Island, Balboa and Panama. The specimens are mostly from rocky tide pools.

311. Apogon pigmentarius (Poey).

Monoprion pigmentarius Poey, Memorias, II, 1860, 123 (Cuba).

Apogon pigmentarius Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1109, Pl. CLXXVIII, fig. 472.

Head 2.55 to 2.7; depth 2.55 to 2.85; D. VI-I, 9; A. II, 8; scales 21 to 23.

Body short and deep, much compressed; the ventral outline anteriorly notably more convex than the dorsal; caudal peduncle long, its depth 2.06 to 2.46 in head; head large, interorbital space narrower than eye, 3.75 to 4.0 in length of head; snout very short and blunt, only about half as long as eye, 5 to 5.85 in head; eye 2.5 to 3.2; mouth large, inferior; the maxillary reaching posterior margin of eye, 1.76 to 1.88 in head; opercle with a stiff spine; preopercle serrate; gill-rakers shorter than pupil, 16, including rudiments, on lower limb of first arch; pseudobranchiæ present; scales large, ctenoid; lateral line complete, closely following the outline of the back; first dorsal rather low, the longest spine slightly shorter than postorbital part of head; second dorsal much higher, the longest rays equal to postorbital part of head and half the eye; caudal fin forked, the upper lobe the larger and longer; anal similar to the second dorsal, only slightly lower, the longest rays notably longer than snout and eye; ventral fins inserted slightly in advance of pectorals, reaching origin of anal; pectorals long, reaching middle of base of anal, 1.35 to 1.6 in head.

Color in spirits brownish; head with black specks; scales with dusky punctulations, which on some individuals form dusky blotches; an oblong, blackish spot on band at base of caudal; base of dorsal and anal sometimes black; spinous dorsal and margin of caudal dusky, fins otherwise plain.

This species is represented by 3 specimens in the present collection, ranging from 50 to 60 mm. in length.

Heretofore recorded only from Cuba. Our specimens are from Colon Reef and Porto Bello.

Family L. Centropomidæ.

The Robalos.

Body moderately elongate, compressed; head long, somewhat depressed above, mouth large, protractile; lower jaw projecting; teeth in villiform bands on jaws, on vomer and palatines; scales small or of moderate size, ctenoid; lateral line little arched, continued to end of caudal; preopercle and supraclavicle serrate; preopercle with a ridge that bears 1 or 2 spines; opercle without spines, produced into a flap; two separate dorsals, the first usually with 8 spines, rarely with only 7; the first spine very small, the second short, the third and fourth the longest; the second dorsal with 1 spine and 8 to 11 branched rays; anal short, with III, 6 or 7 rays; caudal forked; pectorals symmetrical; ventrals inserted behind base of pectorals, with I, 5 rays; air bladder with or without appendages.

123. Genus **Centropomus** Lacépède.

Centropomus Lacépède, Hist. Nat. Poiss., IV, 1803, 248 (type *Sciæna undecimalis* Bloch).

The characters of the genus are included in the family description.

KEY TO THE SPECIES.

a. Scales small, 60 to 90 in a longitudinal series, above lateral line, from supraclavicle serræ to base of caudal; pectorals short, not nearly reaching tips of ventrals, 1.55 to 2.2 in head.

b. Anal with 7 branched rays; the second and third anal spines very long and slender, of about equal length; membrane between second and third anal spines, and the tips of longest rays black; gill-rakers on lower limb of first arch 13 to 15, without rudiments. *pectinatus*, p. 421.

bb. Anal with 6 branched rays; the second anal spine very strong and constantly longer than the third spine, although frequently not reaching the tip of the third; membrane between the second and third anal spines and tips of longest rays often dusky, but not black; gill-rakers on lower limb of first arch 7 to 11, not counting rudiments.

c. Preorbital strongly serrate at all ages; eye large, about 4.2 in head in specimens 6 inches in length; scales small, 77 to 90 in a longitudinal series, above lateral line, from supraclavicle serræ to base of caudal; gill-rakers 10 or 11 on lower limb of first arch, not including rudiments. *parallelus*, p. 423.

cc. Preorbital entire in adult, weakly serrate in young; eye smaller, about 5 in head in specimens 6 inches in length; scales larger, 60 to 77 in longitudinal series, above lateral line, from supraclavicle serræ to base of caudal; gill-rakers 7 to 10 on lower limb of first arch, without rudiments.

d. Branched rays of second dorsal almost constantly 10; scales in longitudinal series, above lateral line, 67 to 77; gill-rakers on lower limb of first arch, exclusive of rudiments, 7 or 8. *undecimalis*, p. 425.

dd. Branched rays in second dorsal 8 to 10, usually 9; scales in longitudinal series, above lateral line, 60 to 73; gill-rakers on lower limb of first arch, exclusive of rudiments, 8 to 10. *nigrescens*, p. 426.

aa. Scales large, 47 to 56 in longitudinal series, above lateral line, from supraclavicle serræ to base of caudal; pectorals longer, reaching to or nearly to tips of ventrals, 1.27 to 1.55 in head.

e. Second anal spine rather small, usually not reaching base of caudal when the fin is deflexed, extending past the tip of the third spine a distance usually less than half the diameter of eye, 1.35 to 1.75 in head; scales 6 or 7 between lateral line and middle of second dorsal, 47 to 56 in longitudinal series above lateral line; gill-rakers 9 to 12 on lower limb of first arch, exclusive of rudiments; lateral line not in a black streak; membrane between second and third anal spines never black. *unionensis*, p. 428.

ee. Second anal spine much enlarged, reaching to or past the base of caudal when the fin is deflexed, extending past the tip of the third spine a distance about equal to or greater than diameter of eye, 1 to 1.55 in head.

f. Gill-rakers numerous, 13 to 17 on lower limb of first arch, exclusive of rudiments; lateral line not in a black streak; membrane between the second and third anal spines not black; scales in vertical series between lateral line and middle of second dorsal, 5 or 5½. *robalito*, p. 430.

ff. Gill-rakers less numerous, 9 to 13 on lower limb of first arch, exclusive of rudiments; lateral line in a black streak (which often fades in preserved specimens); membrane between second and third anal spines black.

g. Body rather deep, robust; the back elevated; anterior profile notably convex; depth 3 to 3.4; mouth large; maxillary 2.3 to 2.5 in head; scales in front of second dorsal small and much

crowded, 19 to 25 in number; 6 to 7½ scales in a vertical series between lateral line and middle of second dorsal.

armatus, p. 431.

gg. Body more elongate; the back little elevated; anterior profile only slightly convex; depth 3.4 to 4.1; mouth smaller; maxillary 2.5 to 2.8 in head; scales in front of second dorsal larger and less crowded, 16 to 18 in number; 5 to 6½ scales in a vertical series between lateral line and middle of second dorsal.

ensiferus, p. 433.

312. Centropomus pectinatus Poey.

Centropomus undecimalis Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 102 (part); Günther, Cat. Fish. Brit. Mus., I, 1859, 79.

Centropomus pectinatus Poey, Memorias, II, 1860, 121 (Havana & Cienfuegos); Boulenger, Cat. Fish. Brit. Mus., Ed. II, I, 1895, 368; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1122; Regan, Biol. Cent. Amer., Pisc., 1907, 46.

Centropomus pedimacula Poey, Memorias, II, 1860, 122; Vaillant & Bocourt, Miss. Sci. Méx., etc., 1874, 29; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1119; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 90; Jordan & Dickerson, Proc. U. S. Nat. Mus., 1908, 14.

Centropomus medius Günther, Proc. Zoöl. Soc. London, 1864, 144 (Chiapam, Guatemala).

Centropomus cuvieri Bocourt, Ann. Sci. Nat., 5 sér., IX, 1868, 91 (Haiti).

Centropomus grandoculatus Jenkins & Evermann, Proc. U. S. Nat. Mus., 1888, 139 (Guaymas); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1120.

Head 2.8 to 3.2; depth 3.3 to 4.1; D. VIII-I, 10; A. III, 7; scales 5 to 8 between lateral line and middle of second dorsal, 62 to 67 in a longitudinal series, above the lateral line, from the supraclavicle serræ to base of caudal.

Body moderately elongate, compressed; the back elevated; anterior profile notably concave; head long, depressed above; eyes large, placed high, 3.2 to 4.7 in head; snout long, ending in the prominently protruding lower jaw, 3.1 to 3.7; mouth rather large, somewhat oblique; maxillary reaching to or slightly past anterior margin of pupil, 2.2 to 2.5 in head; preorbital, preopercle and supraclavicle strongly serrate; preopercular margin with 3 or 4 enlarged serræ at angle; preopercular ridge with 2 spines at angle; opercle without spines, produced into a flap, that does not reach vertical from first dorsal except in

very young; gill-rakers rather long and slender, the longest equal to about half diameter of eye, 13 to 15 movable ones on lower limb of anterior arch; pseudobranchiæ well developed; stomach with 4 cæca; air bladder without appendages, somewhat fusiform, but tapering more posteriorly than anteriorly; scales ctenoid, rather small and crowded in front of spinous dorsal, large elsewhere; all the fins except spinous dorsal more or less scaly at base; spinous dorsal with 8 strong spines, the first 2 short, the third the strongest, also the longest, but not reaching past the tip of the fourth, 1.5 to 1.85 in head; outer posterior margin of fin usually straight; second dorsal with one spine and 10 branched rays, the anterior rays long, but decreasing rapidly in length to the fifth ray, the posterior 5 rays of about equal length, the outer posterior margin of fin deeply concave; caudal deeply forked, both lobes acute; anal fin with 3 spines and 7 branched rays; the first spine short, the second and third very long; the second spine much stronger than the third, but not longer and not reaching past the tip of the third, 1.1 to 1.5 in head; the anterior anal ray very long, usually reaching past the tip of the long spines, the third ray only about half the length of the first, the posterior 4 rays of about equal length; the outer posterior margin of fin concave; ventrals large, rather long, reaching past vent; pectorals small, not nearly reaching tips of ventrals, 1.55 to 1.85 in head.

Color bluish or grayish above, sides and below silvery; tip of snout and lower jaw dusky; lateral line black; in old and poorly preserved specimens the black has often disappeared, leaving it almost, or entirely, pale; fins usually all more or less dusky; the tips of caudal lobes, the tips of ventrals and the tips of the longest anal ray, also the membrane between the second and third anal spines, usually black. The amount of black on fins varies greatly among individuals; in some specimens it almost entirely disappears.

This species is here described from 106 specimens, of which 38 are from the Pacific coast, and the remainder from the Atlantic. The specimens range in length from 65 to 300 mm. We find marked variation with age. In the young the head is comparatively longer, the eye larger, the fin spines longer, and the anterior profile less concave.

We are unable to follow those authors who have attempted to separate the Pacific coast representatives from those of the Atlantic. The only difference that we note in our large series is that the scales above the lateral line of the Pacific coast specimens seem to average somewhat fewer in number. In 19 specimens from the Pacific coast there are from 5 to 7 scales between the lateral line and the second dorsal (count-

ing opposite the fifth ray) with an average of 6.26 scales to a series. In 23 specimens from the Atlantic the range, counted as above, is 6 to 8, with an average of 6.6— scales to a series. In a longitudinal series above the lateral line, from the supraclavicle serræ to base of caudal, for the same 19 specimens from the Pacific mentioned above, the range is from 62 to 67, with an average of 62.4+ scales to a series. For the 23 Atlantic specimens the range is from 61 to 72, with an average of 66.5— scales to a series. This small variation may well occur within a species.

Of the described forms included here, we have been able to examine the type of *C. grandoculatus* Jenkins & Evermann. We find no characters that separate it from *C. pectinatus,* as here described. The first dorsal has 8 spines as usual. The authors probably overlooked either the first or the last, both of which are very short. We count 62 scales in a longitudinal series above the lateral line. This species enters rivers freely and many of our specimens were taken in brackish water.

Known from both coasts of tropical America, ranging on the Atlantic from the West Indies to Bahia and on the Pacific from Guaymas, Mexico, to Buenaventura, Colombia. Our Atlantic specimens are from Mindi, Colon and Porto Bello. The Pacific coast specimens were taken at Chame Point, Balboa, Corozal and Panama City.

313. Centropomus parallelus Poey.

Centropomus parallelus Poey, Memorias, II, 1860, 120 (Havana and Cienfuegos); Günther, Trans. Zoöl. Soc. London, VI, 1869, 407; Vaillant & Bocourt, Miss. Sci. Méx., etc., Pt. IV, 1874, 22; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1122; Regan, Biol. Cent. Amer., Pisc., 1907, 48.

Centropomus mexicanus Bocourt, Ann. Sci. Nat., 5 sér., IX, 1868, 90 (Gulf of Mexico); Vaillant & Bocourt, Miss. Sci. Méx., etc., Pt. IV, 1874, 23, Pl. I, fig. 2; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1121; Meek, Field Col. Mus. Pub., Zoöl. Ser., V, 1904, 199.

Centropomus constantinus Jordan & Starks, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1125 (Bahia, Brazil).

Centropomus heringi Fowler, Proc. Ac. Nat. Sci. Phila., 1906, 425, fig. 2 (Surinam or Dutch Guiana).

Centropomus gabbi Fowler, Proc. Ac. Nat. Sci. Phila., 1906, 423, fig. 1 (eastern San Domingo).

Head 2.7 to 3; depth 3.5 to 4; D. VII or VIII-I, 10 or 11; A. III, 6; scales 8 to 10 between lateral line and middle of second dorsal,

77 to 90 in longitudinal series, above lateral line, from supraclavicle serræ to base of caudal.

Body elongate, moderately compressed; the back elevated; anterior profile only slightly convex; head long and depressed above; eyes large, placed high, 3.6 to 4.9 in head; snout long, ending in the protruding lower jaw, 3 to 3.5; mouth large, nearly horizontal; the maxillary reaching to about middle of eye, 2.25 to 2.4 in head; preorbital, preopercle and the supraclavicle serrate; preopercular ridge with 2 spines at angle; opercle without spines, produced into a flap, which extends to vertical from origin of first dorsal in adult, in young it reaches somewhat past this point; gill-rakers long and slender, 10 to 11 movable ones on lower limb of first arch; pseudobranchiæ well developed; stomach with 4 short cæca; air bladder simple, without appendages, tapering posteriorly, coming to a sharp point rather abruptly; scales ctenoid, smaller than in related species; all the fins except spinous dorsal more or less scaly; the latter usually consisting of 8 strong spines, rarely of 7 (one specimen out of thirteen has only 7 spines in the first dorsal); the third spine is variable in length, somewhat longer, equal to, or often slightly shorter than the fourth, never reaching past the tip of the fourth, when the fin is deflexed, its length 1.75 to 2.2 in head; second dorsal composed of one spine and 10 soft rays, rarely of 11; the anterior rays high, decreasing in length to about the sixth ray; the posterior rays of about equal length; outer posterior margin of fin concave; caudal deeply forked, both lobes acute; anal fin with 3 spines and 6 divided rays; the second spine much enlarged, reaching past the tip of the third spine, its length 1.2 to 1.65 in head; the first ray long, as long as the third spine, the posterior rays of about equal length, not more than half as long as the first ray; the outer posterior margin of fin slightly concave; ventrals moderate, reaching to or past vent; pectorals short, 1.55 to 1.8 in head.

Color bluish gray above, silvery below; lateral line in a black or dusky streak which becomes pale in specimens not well preserved; fins all more or less dusky; the third anal spine usually black.

Our collection contains 21 specimens, ranging from 120 to 580 mm. in length, upon which the above description is based.

This fish ascends streams into fresh water. One of our specimens was taken above rapids in the Rio Charges some distance above Alhajuela, more than fifty miles from the sea. Known from the Atlantic coast of tropical America, from the West Indies to Bahia, Brazil. Our specimens are from the Rio Chagres at Gatun and Alhajuela, New Gatun, Mindi Cut and Colon.

314. Centropomus undecimalis (Bloch). (Plate XLI.)

Sciæna undecimalis Bloch, Naturg. Ausl. Fische, VI, 1792, 60, Pl. CCCIII (Jamaica).

Platycephalus undecimalis Bloch & Schneider, Syst. Ichthyol., 1801, 59.

Centropomus undecim-radiatus Lacépède, Hist. Nat. Poiss., IV, 1803, 268.

Perca loubina Lacépède, Hist. Nat. Poiss., IV, 1803, 418 (Cayenne).

Sphyræna aureoviridis Lacépède, Hist. Nat. Poiss., V, 1803, 325, Pl. IX, fig. 2 (Martinique).

Centropomus undecimalis Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 102, Pl. XIV; Vaillant & Bocourt, Miss. Sci. Méx., etc., Pt. IV, 1874, 17, Pl. II, fig. 1; Günther, Cat. Fish. Brit. Mus., I, 1859, 79; Steindachner, Denkschr. Ak. Wiss. Wien, XXXIX, 1879, 21; Boulenger, Cat. Fish. Brit. Mus., Ed. II, I, 1895, 367; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1118; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 89; Regan, Biol. Cent. Amer., Pisc., 1907, 49; Jordan & Dickerson, Proc. U. S. Nat. Mus., 1908, 13; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 402 (Colon).

Centropomus appendiculatus Poey, Memorias, II, 1860, 119 (Havana and Cienfuegos).

Centropomus argenteus, Regan, Ann. & Mag. Nat. Hist., Ser. 8, XIII, 1904, 260.

Head 2.7 to 3.5; depth 3.9 to 4.8; D. VIII-I, 10 or 11; A. III, 6; scales 7 to 8½ between lateral line and middle of second dorsal, 67 to 77 in longitudinal series, above lateral line, from supraclavicle spines to base of caudal.

Body elongate, somewhat compressed; the back little elevated; anterior profile almost straight in young, somewhat convex in adult; head long and low, depressed above; eye rather small, 4.4 to 7.25 in head; snout long, ending in the projecting lower jaw, 3.1 to 3.6; mouth large, horizontal; maxillary reaching from slightly past middle of eye to slightly past posterior margin of pupil, 2.2 to 2.6 in head; preorbital weakly serrate in young, smooth in adult; preopercle and supraclavicle serrate; 2 to 4 enlarged serræ at angle of preopercle; preopercular ridge with 1 or 2 spines at angle, the lower one, if present, very small; opercle without spines, extended into a flap, which extends to vertical from origin of first dorsal in young, somewhat shorter in adult; gill-rakers rather long, 7 or 8 movable ones on lower limb of anterior arch; pseudobranchiæ well developed; stomach with 4 cæca; intestine short, less than half the length of

body; air bladder anteriorly with 2 lateral appendages, which curve backwards and lie along lateral sides of the bladder, their length is contained from 6 to 6.4 times in total length of bladder; scales moderate, ctenoid; all the fins, except spinous dorsal, more or less scaly at least at base; first dorsal with 8 strong spines, the third equal to or longer than the fourth, usually not reaching tip of the fourth when the fin is deflexed, but occasionally reaching past it, its length 1.75 to 2.3 in head; second dorsal with one spine and 10 branched rays, rarely with only 9 branched rays, the anterior rays long, the posterior rays not more than half as long as the anterior rays; the outer posterior margin of fin concave; caudal forked, with large scales at base; anal constantly with 3 spines and 6 branched rays; the second spine always longer than the third, reaching past the tip of the third in the young when the fin is deflexed, not reaching tip of the third in the adult, also proportionately shorter in the adult, its length 1.45 to 2.3 in head; ventrals moderate, reaching vent in young, shorter in adult; pectorals moderate, not reaching tips of ventrals, but of about equal length, 1.8 to 1.95 in head.

Color bluish gray above, silvery below; lateral line in a black streak; sides usually with dusky punctulations; fins somewhat dusky; ventrals without black; peritoneum and lining of gill-covers silvery.

This species is represented in our collection by 37 specimens, ranging from 85 to 460 mm. in length, which form the basis for the above description.

Known from the Atlantic coast of tropical America, ascending streams, but apparently not far, as only a few of our specimens were taken in streams a short distance above brackish water. It ranges from Florida to Rio de Janeiro, Brazil. Our specimens are from Toro Point, New Gatun, Mindi, Colon and Porto Bello.

315. Centropomus nigrescens Günther. (Plate XLII.)

Centropomus nigrescens Günther, Proc. Zoöl. Soc. London, 1864, 144 (Chiapam), and Trans. Zoöl. Soc. London, VI, 1869, 407; Vaillant & Bocourt, Miss. Sci. Méx., etc., Pt. IV, 1874, 20, Pl. I, fig. 1; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1119; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 90; Regan, Biol. Cent. Amer., Pisc., 1907, 50.

Centropomus viridis Lockington, Proc. Cal. Ac. Sci., VII, 1876 (1877), 110 (off Asuncion Island, Lower Calif.); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1118; Regan, Biol. Cent. Amer., Pisc., 1907, 50.

Centropomus undecimalis Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 89 (part).

Head 2.7 to 3.1; depth 3.7 to 4.5; D. VIII-I or VII-II, 8 to 10; A. III, 6; scales 7 to 9 between lateral line and middle of second dorsal, 60 to 73 in longitudinal series from supraclavicle to base of caudal.

Body elongate, somewhat compressed; the back moderately elevated; anterior profile straight, except in very large examples where it becomes convex; head long, somewhat depressed above; eye rather small, 4.3 to 8.6 in head; snout long, ending in the protruding lower jaw, 3.15 to 3.7; mouth large, nearly horizontal; maxillary reaching from posterior margin of pupil to posterior margin of eye, 2.2 to 2.6 in head; preorbital weakly serrate in young, entire in adult; preopercle and supraclavicle serrate; the serræ at preopercular angle enlarged; preopercular ridge with only one developed spine at angle, smooth in adult; opercle without spines, produced into a flap, which reaches vertical from origin of first dorsal in young, shorter in adult; gill-rakers rather long, 8 to 10 movable ones on lower limb of anterior arch; pseudobranchiæ well developed; stomach with 4 cæca; air bladder simple or with appendages which vary from mere rudiments to one-fourth the total length of the air bladder; scales of moderate size, ctenoid; all the fins except spinous dorsal more or less scaly, at least at the base; first dorsal with 8 spines, rarely with only 7; the first dorsal spine very small, the third usually the longest, sometimes the third and fourth are of equal length, occasionally the third is shorter than the fourth, 1.7 to 2.5 in head; second dorsal usually with 1 spine, occasionally with 2 spines, and with 8 to 10 branched rays, the anterior rays long, decreasing rapidly in length to the sixth ray, the remaining rays of about equal length and not more than half the length of the anterior ray; the outer posterior margin of fin concave; caudal forked, both lobes acute; anal constantly with 3 spines and 6 branched rays; the second spine enlarged, constantly larger than the third, reaching past the tip of third when the fin is deflexed only in the very young, not reaching tip of third in adult, also proportionately shorter in adult, 2.1 to 2.6 in head; the anterior ray very long, reaching past tip of longest spine in adult, shorter in young; ventrals moderate, reaching vent in young, not nearly reaching vent in adult; pectorals rather short, not reaching tip of ventrals, 1.8 to 2.2 in head.

Color bluish gray to bluish black above, silvery below; sides with dusky punctulations; lateral line in a black streak; fins usually all more or less dusky; ventrals usually with black on distal third.

Of this species 54 specimens, ranging from 80 to 580 mm. in length, were preserved and form the basis for the above description. We have here included *C. viridis,* which was supposed to differ from *C. nigrescens* mainly in that it had an air bladder with appendages. It has already been noted by Gilbert & Starks (1904) that the length of the appendages of the air bladder in *C. viridis*=*C. undecimalis* vary greatly. A further examination of 16 specimens shows them in all stages of development. Of the specimens examined, 4 have the air bladder entirely without appendages, 6 have mere rudiments, and 6 have appendages variously developed, ranging in length from 1/12 to ¼ of the total length of the bladder. We find no external characters that are of distinctive value. *C. nigrescens* is very closely related to *C. undecimalis* of the Atlantic coast, from which it can scarcely be separated. *C. nigrescens* has from 8 to 10 movable gill-rakers on the lower limb of the anterior arch; *C. undecimalis* has 7 or 8. The former has from 8 to 10, usually 9, branched rays in the second dorsal; the latter almost constantly has 10. The scales in a longitudinal series above the lateral line, from the supraclavicle serræ to base of caudal, are usually fewer in number in *C. nigrescens.* The range in 23 specimens in the scales in a lateral series is from 60 to 73, with an average of 68—. In 23 specimens of *C. undecimalis,* the range in the longitudinal series (counted as above) is from 66 to 77, with an average of 72+ scales. The air bladder in all specimens of *C. undecimalis* examined has appendages.

Known from the Pacific coast of tropical America. It enters streams freely. Some of our specimens were taken in fresh water streams above tide influence. Recorded from Lower California to Guayaquil, Ecuador. Our specimens were taken at Chame, Chame Point, Balboa, Corozal, Miraflores, Rio Mamone and Rio Calobre.

316. Centropomus unionensis Bocourt.

Centropomus unionensis Bocourt, Ann. Sci. Nat., 5 sér., IX, 1868, 90 (La Union, El Salvador); Vaillant & Bocourt, Miss. Sci. Méx., etc., Pt. IV, 1874, 37; Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXIV) Ichth. Beitr., V, 1876, 1; Boulenger, Cat. Fish. Brit. Mus., Ed. II, I, 1895, 370; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1122; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 90, Pl. XII, fig. 27; Regan, Biol. Cent. Amer., Pisc., 1907, 53; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 409 (Panama).

Head 2.7 to 3.1; depth 2.9 to 3.6; D. VIII-I, 9 or 10; A. III, 6; scales 6 or 7 between lateral line and middle of second dorsal, 47 to

50 in longitudinal series, above lateral line, from supraclavicle serræ to base of caudal.

Body moderately elongate, compressed; the back elevated; anterior profile convex, rather steep at nape; head rather long, depressed above; snout long, ending in the protruding lower jaw, 3.1 to 3.6 in head; eye 4.15 to 5.7; mouth large, horizontal; the maxillary reaching from middle of eye to posterior margin of pupil, 2.2 to 2.6 in head; preorbital, preopercle and supraclavicle serrate; preopercle with 2 enlarged teeth at angle; preopercular ridge with one small and one large spine at angle; opercle without spines, produced into a flap, reaching to about vertical from origin of first dorsal; gill-rakers moderate, 9 to 12 movable ones on lower limb of anterior arch; pseudobranchiæ well developed; stomach with 4 cæca; air bladder anteriorly with 2 short processes; scales ctenoid, large, and not greatly crowded in front of first dorsal, 13 to 17 in a series in advance of dorsal; all the fins, except spinous dorsal, more or less scaly at base; the first dorsal with 8 spines, the third and fourth spines usually of about equal length, sometimes, however, the third is notably longer and again it is somewhat shorter, 1.7 to 2.05 in head; second dorsal with one spine and usually with 9, occasionally with 10, branched rays; the anterior rays long, more than twice the length of the posterior; outer posterior margin of fin concave; caudal forked, the lobes of equal length, acute; anal with 3 spines and 6 branched rays; the second spine moderately enlarged, extending past the tip of the third spine a distance usually less than half the diameter of eye, usually not quite reaching the base of caudal, 1.35 to 1.75 in head; ventrals reaching vent in adult, past vent in young; pectorals moderate, not reaching tips of ventrals, 1.3 to 1.47 in head.

Color bluish gray above, silvery below; lateral line not in a dark streak; fins usually all more or less dusky; spinous dorsal usually black; membrane between second and third anal spine pale or only slightly dusky.

This species is represented by 37 specimens, ranging from 95 to 220 mm. in length, upon which the above description is based. It differs mainly from *C. armatus* in the shorter and weaker fin spines, the lateral line is not in a black streak, the membrane between the second and third anal spines is not black, and the scales in front of the first dorsal are fewer in number and less crowded. From *C. robalito* it differs mainly in having more scales between the lateral line and second dorsal, fewer gill-rakers, and smaller fin spines. It is abundant in tide streams.

Known from the Pacific coast of tropical America, namely, La Union, El Salvador; Panama City, Corozal and Rio Culebra, Panama; and Guayaquil, Ecuador.

317. Centropomus robalito Jordan & Gilbert.

Centropomus armatus Günther, Trans. Zoöl. Soc. London, VI, 1869, 408 (not of Gill).

Centropomus robalito Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 462 (Mazatlan, Acapulco); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1123; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 94, Pl. XIII, fig. 25; Regan, Biol. Cent. Amer., Pisc., 1907, 51; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 101.

Centropomus ensiferus Boulenger, Cat. Fish. Brit. Mus., Ed. II, I, 1895, 369 (not of Poey).

Head 2.7 to 3; depth 3.1 to 3.8; D. VIII-I, 10; A. III, 6; scales 5 or 5½ between lateral line and middle of second dorsal, 50 to 53 in longitudinal series, above lateral line, from supraclavicle serræ to base of caudal.

Body moderately elongate, compressed; the back elevated; anterior profile notably convex over head, steep at nape; head long, depressed above; snout long, ending in the protruding lower jaw, 3.1 to 3.4 in head; eye 3.7 to 5.7; mouth large, horizontal; the maxillary reaching about middle of eye, 2.4 to 2.7 in head; preorbital, preopercle and supraclavicle serrate; preopercular ridge with one small and one well developed spine; opercle without spines, produced into a flap, which reaches somewhat past the vertical from origin of first dorsal; gill-rakers numerous, 13 to 17 movable ones on lower limb of anterior arch; pseudobranchiæ well developed; stomach with 4 cæca; air bladder anteriorly with 2 short processes; scales ctenoid, large, not greatly crowded in front of first dorsal, 13 to 16 in a series in advance of dorsal; all the fins, except spinous dorsal, more or less scaly, at least at base; first dorsal with 8 spines; the third dorsal spine equal to or longer than the fourth, but never reaching past the tip of the fourth when fin is deflexed, 1.6 to 1.9 in head; second dorsal with one spine and 10 branched rays, the anterior rays long, the posterior rays about half the length of the first, outer posterior margin of fin concave; caudal forked, the lobes acute, of equal length; anal with 3 spines and 6 branched rays, the second spine notably enlarged, extending past the tip of the third spine, a distance somewhat smaller than the diameter of the eye, reaching to or past the base of caudal when fin is deflexed,

1.15 to 1.55 in head; the anterior ray long, reaching slightly past the tip of the third spine, the posterior ray less than half the length of the anterior; outer posterior margin of fin concave; ventrals rather long, reaching vent in adult and past vent in young; pectorals moderate, not quite reaching tip of ventral, 1.4 to 1.55 in head.

Color bluish gray above, silvery below; lateral line not in a black streak; all the fins usually more or less dusky; spinous dorsal usually black; the membrane between the second and third anal spines not black.

Our collection contains 28 specimens, ranging from 70 to 240 mm. in length, and they form the basis for the above description. This species differs from *C. armatus* mainly in having fewer scales between lateral line and second dorsal, also fewer and less crowded scales in front of first dorsal, the gill-rakers are more numerous, the fin spines are somewhat shorter, and the lateral line is not in a dark streak. It is abundant in tide streams.

Known from the Pacific coast of tropical America, from Rio Presidio, Mexico, to Panama. Our specimens are from Arrijan, Balboa, Corozal and Panama City.

318. Centropomus armatus Gill.

Centropomus armatus Gill, Proc. Ac. Nat. Sci. Phila., 1863, 163 Panama); Vaillant & Bocourt, Miss. Sci. Méx., etc., Pt. IV, 1874, 34; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1123; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 92, Pl. XIII, fig. 26; Regan, Biol. Cent. Amer., Pisc., 1907, 52.

Centropomus brevis Günther, Proc. Zoöl. Soc. London, 1864, 145.

Centropomus ensiferus Boulenger, Cat. Fish. Brit. Mus., Ed. II, I, 1895, 369 (not of Poey).

Centropomus atridorsalis Regan, Ann. & Mag. Nat. Hist., Ser. 7, XII, 1903, 627 (Rio Vauqueria, Ecuador).

Head 2.7 to 2.95; depth 3 to 3.4; D. VII or VIII-I, 9 or 10; A. III, 6; scales 6 to 7½ between lateral line and middle of second dorsal, 47 to 55 in longitudinal series, above lateral line, from supraclavicle serræ to base of caudal.

Body robust, moderately elongate, compressed; the back elevated; anterior profile notably convex, especially in adult, rather steep over posterior part of head; head long, depressed over eyes; snout long, ending in the protruding lower jaw, 3.1 to 3.8 in head; eye 4.1 to 6.1; mouth large, horizontal, the maxillary reaching from middle of eye to posterior margin of pupil, 2.3 to 2.5 in head; preorbital, preopercle and supraclavicle serrate at all ages; preopercle with 2 enlarged teeth at

angle; preopercular ridge with but one developed spine at angle; opercle without spines, produced into a flap, which usually reaches somewhat past the origin of first dorsal; gill-rakers moderate, from 9 to 12 movable ones on lower limb of anterior arch; pseudobranchiæ well developed; stomach with 4 cæca; intestine very short, much less than half the length of the body; air bladder simple, without appendages; scales ctenoid, small and crowded in front of first dorsal, 19 to 25 in number, large elsewhere; all the fins, except spinous dorsal, more or less scaly, at least at base; first dorsal with 8 strong spines, rarely with 7, the third and fourth spines the longest, usually about equal length, although in some of our specimens the third spine is notably longer than the fourth, and in others it is shorter, the third never reaching past the tip of the fourth when fin is deflexed, 1.55 to 2.3 in head; second dorsal with one spine and 10 rays, occasionally with only 9, the anterior ray about two times as long as the posterior, outer posterior margin of fin concave; caudal forked, the lobes acute, of equal length; anal with 3 spines and 6 branched rays; the second anal spine much enlarged, varying greatly in length among individuals, constantly extending far past the tip of the third spine, reaching to or past base of caudal when fin is deflexed, 1.1 to 1.55 in head; the anterior branched ray of anal equal to or slightly longer than the third spine, more than twice the length of the posterior rays, outer posterior margin of fin somewhat concave; ventrals moderate, reaching past vent in young, proportionately shorter in adult, reaching only about ¾ of the distance from their base to vent; pectorals long, reaching to or past the tips of the ventrals, 1.27 to 1.48 in head.

Color bluish gray above, silvery below; sides usually with dusky punctulations; lateral line in a dark streak, which fades readily in alcohol; all the fins usually dusky; the membranes between spines of first dorsal and between second and third anal spines black.

This species is very abundant in the tide streams of the Pacific coast of Panama, 98 specimens, ranging from 80 to 265 mm. in length, were preserved, and these form the basis for the above description. This species is close to *C. ensiferus*, from which it differs mainly in the deeper and more robust body (average depth of 26 specimens of *C. armatus* is 3.34—, of 24 specimens of *C. ensiferus* 3.76+); stronger fin spines; smaller and more crowded scales in front of first dorsal; more rows of scales between lateral line and second dorsal (average number of scales in vertical series between lateral line and middle of second dorsal in 26 specimens of *C. armatus* is 6.77+, in 24 specimens of *C. ensiferus* 5.52+); and in the somewhat larger mouth.

Known from the Pacific coast of tropical America, from Chiapam, Guatemala, to Guayaquil, Ecuador. Our specimens are from Balboa, Corozal, Panama City, Rio Culebra and Rio Calobre.

319. Centropomus ensiferus Poey.

Centropomus ensiferus Poey, Memorias, II, 1860, 122, Pl. XII, fig. 1 (Havana); Günther, Trans. Zoöl. Soc. London, VI, 1869, 408; Vaillant & Bocourt, Miss. Sci. Méx., etc., Pt. IV, 1874, 33; Steindachner, Denkshr. Ak. Wiss. Wien, XXXIX, 1879, 21; Jordan, Proc. U. S. Nat. Mus., 1886, 39; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1125; Regan, Biol. Cent. Amer., Pisc., 1907, 52.

Centropomus affinis Steindachner, (Sitzb. k. Ak. Wiss. Wien, XLIX) Ichth. Notizen, I, 1864, 1, Pl. I, fig. 1 (Rio de Janeiro and Cajutuba, Brazil; Demerara, Guiana); Vaillant and Bocourt, Miss. Sci. Méx., etc., Pt. IV, 1874, 31, Pl. I, fig. 1; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1124.

Centropomus scaber Bocourt, Ann. Sci. Nat., 5 sér., IX, 1868, 90 (marshes of Belize).

Centropomus altus Regan, Biol. Cent. Amer., Pisc., 1907, 53, Pl. VIII, fig. 1 (Colon, Panama).

Head 2.7 to 3; depth 3.4 to 4.1; D. VIII-I, 10; A. III, 6; scales 5 to 6½ between lateral line and middle of second dorsal, 50 to 56 in longitudinal series, above lateral line, from supraclavicle serræ to base of caudal.

Body elongate, moderately compressed; the back little elevated; anterior profile not steep, nearly straight in young, slightly convex over anterior portion of head in adult; head long and low; snout long, ending in the protruding lower jaw, 2.95 to 3.8 in head; eye 3.8 to 6.4; mouth moderate, horizontal; the maxillary reaching to about middle of eye, 2.5 to 2.8 in head; preorbital, preopercle and supraclavicle serrate; preopercle with 2 enlarged teeth at angle; preopercular ridge with one small and one well developed spine; opercle without spines, produced into a flap which extends well past the vertical from origin of first dorsal; gill-rakers moderate, from 10 to 13 movable ones on lower limb of anterior arch; pseudobranchiæ well developed; stomach with 4 short cæca; intestine very short; air bladder simple, without appendages; scales strongly ctenoid, rather large, not greatly crowded in front of first dorsal, 16 to 18 in a series in advance of dorsal; all the fins, except spinous dorsal, more or less scaly, at least at base; first dorsal with 8 spines, which are not as strong as those of *C. armatus* of the Pacific

coast, its nearest relative; the third spine equal to or longer than the fourth, never reaching past the tip of the fourth when the fin is deflexed, 1.65 to 2.2 in head; second dorsal with one spine and 10 branched rays, the anterior rays long, more than twice the length of the posterior rays; outer posterior margin of fin concave; caudal forked, both lobes of equal length, acute; anal with 3 spines and 6 branched rays; the second anal spine excessively long, but not as strong as in *C. armatus,* extending far past the tip of the third spine, reaching past the base of the caudal when fin is deflexed, 1 to 1.35 in head; the anterior branched anal ray equal to or longer than the third spine, more than twice the length of the posterior ray; outer posterior margin of anal fin concave; ventrals moderate, reaching past vent in young, proportionately shorter in adult, when they do not reach vent; pectorals moderate, reaching about to tip of ventrals, 1.4 to 1.5 in head.

Color bluish gray or brownish above, silvery below; sides with or without dark points; lateral line in a dark streak which often fades in alcohol; fins all more or less dusky; the membranes between the spines of first dorsal and between second and third anal spines black.

This species was found less abundantly than most of the other species of this genus from the Atlantic coast. Our collection contains 25 specimens, ranging from 60 to 230 mm. in length. The above description is based on these specimens and numerous others, in the National Museum collection from the West Indies, that we have examined.

Known from the West Indies and the Atlantic coast of tropical America, from Cuba to Rio de Janeiro, Brazil. Our specimens were taken at New Gatun, Mindi Cut, Colon and Porto Bello.

Family LI. Serranidæ.

The Sea Basses.

Body oblong, more or less compressed; mouth moderate, or large, more or less oblique; premaxillaries protractile; maxillary broad, exposed; teeth conical or pointed, present on jaws, vomer and palatines; gills 4, a slit behind the fourth; gill-membranes free from the isthmus; branchiostegals 6 or 7; nostrils 2 on each side; lateral line usually complete, rarely interrupted on side; never extending on caudal fin; scales adherent, moderate or small, usually ctenoid, extending forward on opercle and cheeks; dorsal spines stiff, from 2 to 15 in number; soft dorsal with 10 to 30 rays; anal fin short, spines if present always 3, soft rays 7 to 12; ventrals thoracic, without axillary scale, with I, 5 rays.

This is a very large family, consisting chiefly of marine species inhabiting all warm seas. So far as known, the species are carnivorous, some of them reach a very large size, and most of them are valued as food. The members of this family, known as groupers, command a fancy price in the markets on the Isthmus of Panama.

KEY TO THE GENERA.

a. Ventral fins inserted a little behind the base of pectorals.

b. Dorsal normally with 9 spines.

c. Caudal fin deeply forked, the lobes notably produced; dorsal fin very low, with 19 or 20 soft rays; gill-rakers long and slender, about 25 on lower limb of first arch. *Paranthias*, p. 436.

cc. Caudal fin rounded; dorsal fin notably higher, with 14 to 17 soft rays; gill-rakers rather short, fewer than 18 on lower limb of first arch.

d. Dorsal rays IX, 15 to 17; anal rays III, 9. *Cephalopholis*, p. 438.

dd. Dorsal rays IX, 14; anal rays III, 8. *Petrometopon*, p. 441.

bb. Dorsal normally with 10 or 11 spines.

e. Anal fin rather long, with 11 or 12 soft rays. *Mycteroperca*, p. 444.

ee. Anal fin shorter, with 7 or 8 soft rays.

f. Maxillary with a distinct supplemental bone; jaws with enlarged, depressible teeth behind the outside row.

g. Posterior margin of preopercle serrate, the lower limb entire, no antrorse spines.

h. Cranium broad, depressed between the eyes; scales of lateral line each with 4 to 6 strong radiating ridges. *Promicrops*, p. 450.

hh. Cranium narrower, not depressed between the eyes; scales of lateral line normal, simply with radiating striæ. *Epinephelus*, p. 452.

gg. Posterior margin of preopercle serrate, a single strong antrorse spine on lower posterior angle. *Alphestes*, p. 463.

ff. Maxillary without a supplemental bone; jaws without enlarged depressible teeth.

i. Body robust, the back not notably elevated; dorsal fin notched, some of the anterior spines notably elevated; lower limb of preopercle entire. *Paralabrax*, p. 466.

ii. Body deep and compressed, the back notably elevated; dorsal fin not notched, none of the spines high; lower limb of preopercle distinctly serrate. *Hypoplectrus*, p. 467.

aa. Ventral fins inserted a little in advance of base of pectorals.

j. Anal fin with 3 spines; dorsal with 7 to 10 spines.

k. Lateral line simple, complete, not interrupted; preopercular margin serrate, the serræ arranged in clusters or not.

l. Preopercular margin finely serrate, the serræ not arranged in clusters. *Prionodes*, p. 470.

ll. Preopercle with 1 or 2 clusters of strong, diverging spines. *Diplectrum*, p. 472.

kk. Lateral line interrupted under posterior part of soft dorsal, reappearing lower down on side; preopercular margin with a single broad spine, otherwise smooth; opercle without evident spine. *Rhegma*, p. 478.

jj. Anal fin without spine; dorsal fin with 2 or 3 spines; preopercle provided with 2 or 3 spines, otherwise smooth; opercle with 2 or 3 spines. *Rypticus*, p. 479.

124. Genus **Paranthias** Guichenot.

Brachyrhinus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 236 (type *Serranus creolus* Cuvier & Valenciennes = *Serranus furcifer* Cuvier & Valenciennes; name preoccupied).

Paranthias Guichenot, Ann. Soc. Linn. Maine et Loire, X, 1868, 87 (type *Serranus creolus* Cuvier & Valenciennes = *Serranus furcifer* Cuvier & Valenciennes).

Body elongate, compressed; head short, rather blunt; mouth moderate; maxillary of moderate width; teeth in narrow bands, 2 to 4 anterior canines present; preopercular margin finely serrate; gill-rakers slender, rather numerous; lateral line simple, complete; scales small, ctenoid on body, cycloid on head; dorsal fin low, with 9 spines; caudal fin deeply forked; anal fin rather short, with III, 9 or 10 rays; ventrals rather long, narrow, inserted just behind base of pectorals; pectorals long, slightly pointed.

A single species of this genus is known.

320. **Paranthias furcifer** (Cuvier & Valenciennes).

Serranus furcifer Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 196 (Brazil).

Serranus creolus Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 197 (Martinique); Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXII) Ichth. Beitr., IV, 1875, 6 (Panama Bay).

Corvina oxyptera De Kay, Fauna N. Y., Fishes, 1842, 77, Pl. XXX, fig. 96 (no locality).

Serranus colonus Valenciennes, Voy. Vénus, Zoöl., 1846, Pl. II, fig. 1, text, 1855, 300 (Galapagos Is.).

Anthias furcifer Günther, Cat. Fish. Brit. Mus., I, 1859, 91.

Brachyrhinus creolus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 249.

Paranthias creolus Guichenot, Ann. Soc. Linn. Maine et Loire, X, 1868, 87.

Paranthias furcifer Guichenot, Ann. Soc. Linn. Maine et Loire, X, 1868, 87; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1221, Pl. CXCII, fig. 504; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 110 (Panama; Toboguilla Island).

Brachyrhinus furcifer Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 916.

Head 3.33 to 3.6; depth 2.75 to 2.9; D. IX, 19 or 20; A. III, 10; scales 105 to 118.

Body rather deep; dorsal and ventral outlines anteriorly both convex, the dorsal outline more strongly curved than the ventral; head rather short and deep; snout short and rather blunt, 3.85 to 4.8 in head; eye 3.85 to 4.2; mouth moderate, oblique; lower jaw projecting; maxillary reaching to or a little beyond middle of eye, 2.25 to 2.4 in head; teeth small, in villiform bands on jaws, vomer and palatines, each jaw with a very small pair of canines anteriorly; preopercular margin finely serrate, the serræ at angle scarcely enlarged; opercle short, with 3 spines, the middle one the longest; gill-rakers slender, about ¾ the diameter of eye, 24 to 26 on lower limb of first arch; scales small, ctenoid on body, smooth on head, extended on base of caudal fin; dorsal fin long, without notch, the first spine short, the second only slightly shorter than the third, the third and succeeding spines of about equal length, the soft part of fin scarcely higher than the spines, the posterior rays slightly shorter than the anterior ones; caudal fin deeply forked, both lobes produced, pointed, the upper one the longer, equal to or longer than head; anal fin with 3 spines, the second and third of about equal length, the soft part a little higher than soft dorsal; ventral fins narrow, inserted a little behind base of pectorals; pectoral fins reaching well beyond tips of ventrals, slightly pointed, 1 to 1.1 in head.

Color uniform brownish above, lower parts and all the fins except dorsal blood red; the base of dorsal very dark, distal parts reddish green.

This fish is represented by 7 specimens in the present collection, ranging from 200 to 268 mm. in length, which were taken along the rocky shores of Taboga Island by the use of dynamite. It was seen only on this occasion. Numerous specimens were taken at Taboguilla Island by the Albatross in 1905. We have no specimens for comparison from the Atlantic.

Known from both coasts of tropical America, from Cuba to Brazil and from Cape San Lucas to Peru. Our specimens are from Taboga Island.

125. Genus **Cephalopholis** Bloch & Schneider.

Cephalopholis Bloch & Schneider, Syst. Ichth., 1801, 311 (type *Cephalopholis argus* Bloch & Schneider).

Enneacentrus Gill, Proc. Ac. Nat. Sci. Phila., 1865, 105 (type *Serranus ouatalibi* Cuvier & Valenciennes).

Menephorus Poey, Ann. Lyc. Nat. Hist. N. Y., X, 1871, 50 (type *Serranus dubius* Poey).

This genus differs from *Epinephelus* chiefly in the presence of 9, instead of 11, spines in the dorsal fin.

"In character of cranium the two genera differ little, the skull above having its bones thin and smooth, the angular ridge on the posterior part of the frontals being wanting, the parietal and supra-occipital crests not extending on the frontals." (Jordan & Evermann.)

KEY TO THE SPECIES.

a. Dorsal fin with 15 soft rays; the soft dorsal and anal with convex outlines; gill-rakers about as long as pupil, 12 to 14 on lower limb of first arch. *fulvus*, p. 438.

aa. Dorsal fin with 17 soft rays; the soft dorsal and anal with some of the rays produced, making the outlines angular; gill-rakers about half the diameter of eye, 17 on lower limb of first arch. *acanthistius*, p. 440.

321. Cephalopholis fulvus (Linnæus).

Labrus fulvus Linnæus, Syst. Nat., Ed. X, 1758, 287 (Bahamas).

Perca punctata Linnæus, Syst. Nat., Ed. X, 1758, 291 (Bahamas).

Guativere amarilla Parra, Desc. Piezas de Hist. Nat., 1787, Pl. V, fig. 2 (Cuba).

Perca punctulata Gmelin, Syst. Nat. Hist., 1789, 1315 (Bahamas).

Holocentrus auratus Bloch, Naturg. Ausl. Fische, IV, 1790, 75, Pl. CCXXXVI (East Indies).

Bodianus guativere Bloch & Schneider, Syst. Ichthyol., 1801, 336 (Cuba).

Serranus auratus Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 364.

Serranus ouatalibi Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 381 (Havana).

Serranus guativere Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 383.

Serranus carauna Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 384 (Brazil).

Enneacentrus punctatus Poey, Syn. Pisc. Cub., 1868, 288.

Epinephelus fulvus Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 402.

Bodianus fulvus Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 379.

Bodianus fulvus ruber Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 379.

Bodianus fulvus punctatus Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 380.

Epinephelus punctatus Boulenger, Cat. Fish. Brit. Mus., Ed. II, I, 1895, 183, fig. 16 (skull).

Cephalopholis fulvus Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 45 (Natal).

Head 2.65 to 3; depth 2.7 to 3; D. IX, 15; A. III, 9 (rarely 8); scales 89 to 96.

Body elongate, moderately compressed; anterior profile rather strongly convex; head moderate; snout rather acute, 3.75 to 4.4 in head; eye 3.8 to 4.7; mouth large; lower jaw strongly projecting; maxillary broad, reaching well beyond eye, 1.8 to 1.95 in head; teeth moderate, pointed, in narrow bands on jaws, vomer and palatines; a pair of very small fixed canines on anterior margin of each jaw, shorter but stronger than the depressible teeth behind them; preopercular margin finely serrate, the serræ at angle scarcely enlarged, a slight notch above angle; gill-rakers not much longer than pupil, 12 to 14 on lower limb of first arch; scales small, strongly ctenoid posteriorly, becoming smooth in advance of dorsal; dorsal fin moderate, the third and fourth spines the longest, the posterior spines only slightly reduced, the soft part of dorsal higher than the spines, with convex outline; caudal fin gently rounded; anal fin rather small, the second and third spines of about equal length,

approximately ¾ the length of the longest soft rays, the outline of fin strongly convex; ventral fins narrow, somewhat shorter than the pectorals; pectoral fins reaching well beyond tips of ventrals, 1.25 to 1.4 in head.

Color in life nearly black above, lower parts rusty red; sides and back everywhere with small round black spots; dorsal and caudal dark at base, becoming red distally; soft part of dorsal and caudal with pale margins; other fins bluish red. Some of our specimens are considerably darker than others, but all are profusely spotted with small, round, black dots.

We have 10 specimens, ranging in length from 127 to 190 mm. Our specimens are probably nearest the variety, *C. fulvus ruber,* of Jordan and coauthors. The species is not abundant on the coast of Panama.

Known from Florida to Brazil. Our specimens are from Toro Point and Porto Bello.

322. Cephalopholis acanthistius (Gilbert).

Bodianus acanthistius Gilbert, Proc. U. S. Nat. Mus., 1891, 552 (Cape Lobos, on eastern shore of Gulf of California); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1147.

Head 2.45; depth 2.7; D. IX, 17; A. III, 9; scales 86.

Body elongate, compressed; anterior profile, rather strongly convex; head moderate; the snout rather short and blunt, 4.05 in head; eye large, 4.05; mouth moderate, oblique; lower jaw rather strongly projecting; maxillary broad, reaching vertical from posterior margin of eye, 1.95 in head; teeth all pointed, in narrow bands, or partly in 2 series laterally in the mandible, a pair of very small, fixed canines on anterior margin of each jaw; preopercular margin serrate, the serræ considerably enlarged at angle, the margin without evident notch; gill-rakers rather slender, the longest about half the diameter of eye, 17 more or less developed on lower limb of first arch; scales small, very weakly ctenoid posteriorly, becoming smooth on anterior part of body; dorsal spines slender, the third and fourth the longest, notably longer than the posterior spines, the soft dorsal notably higher than the spines, the median rays somewhat produced, making the outline of fin strongly angulate; caudal fin with strongly convex margin; anal spines graduated, the second one notably shorter than the third, the soft rays high, with slightly angulate margin; ventral fins rather large, the outer rays produced, pointed; pectoral fins long, round, reaching past tips of ventrals to opposite origin of anal, 1.4 in head.

Color in alcohol uniform brown; a dark stripe at sides above maxillary; fins all bluish black.

A single specimen, 172 mm. in length, of this rare species occurs in the present collection. We compared this specimen with the type of the species with which it agrees admirably, although much smaller than the original.

Previously known only from the type from Cape Lobos on the eastern shore of the Gulf of California. Our specimen is from the Panama City market.

126. Genus **Petrometopon** Gill.

Petrometopon Gill, Proc. Ac. Nat. Sci. Phila., 1865, 105 (type *Sparus cruentatus* Lacépède).

Body oblong, compressed; head large, acute; mouth large, oblique; frontal bones with an anterior groove for the reception of the posterior processes of the premaxillaries; scales small, ctenoid, more or less embedded on head and nape; dorsal with 9 spines; anal with III, 8 rays; ventral fins inserted a little behind base of pectorals.

KEY TO THE SPECIES.

a. Lower part of sides of head and body and the lower surface of head, chest and abdomen with more or less distinct dark red, round spots; no blue spots; sides without dark bars; a small black spot on back at base of anterior rays of soft dorsal. *cruentatus*, p. 441.

aa. Sides with from 8 to 10 more or less distinct dark cross-bars; sides of head with more or less distinct bluish spots, these most distinct on lips; usually a black blotch behind eye; no dark red spots present on lower part of head or body. *panamensis*, p. 443.

323. Petrometopon cruentatus (Lacépède).

Sparus cruentatus Lacépède, Hist. Nat. Poiss., IV, 1803, 157, Pl. IV, fig. 1 (Martinique; on a drawing by Plumier).

Serranus coronatus Günther, Cat. Fish. Brit. Mus., I, 1859, 124.

Serranus apiarius Poey, Memorias, II, 1860, 143 (Havana).

Petrometopon apiarius Poey, Syn. Pisc. Cub., 1868, 288.

Enneacentrus guttatus Jordan and Swain, Proc. U. S. Nat. Mus., 1884, 398.

Bodianus cruentatus Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 378.

Epinephelus guttatus Boulenger, Cat. Fish. Brit. Mus., Ed. II, I, 1895, 176.

Petrometopon cruentatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1141.

Head 2.5 to 2.9; depth 2.55 to 3.1; D. IX, 14; A. III, 8; scales 81 to 90.

Body oblong, compressed; dorsal profile evenly rounded; head rather large, compressed; snout acute, 3.2 to 4.25 in head; eye 4.85 to 5.7; mouth large, oblique; lower jaw strongly projecting; maxillary broad, extending well beyond eye, 1.75 to 2 in head; teeth all sharply pointed, in narrow bands on jaws, vomer and palatines, the depressible teeth in the jaws long and slender, especially those in anterior part of upper jaw; anterior margin of upper jaw with a pair of fixed, recurved canines; preopercular margin very finely serrate; opercle with 3 flat spines; gill-rakers short, 9 or 10 on lower limb of first arch; lateral line arched anteriorly, scarcely confluent with dorsal outline; scales small, strongly ctenoid, those on head and nape slightly imbedded; dorsal fin long, the spines strong, graduated, the soft part with rounded outline, higher than the spines; caudal round, a little more than half the length of head; anal fin with 3 strong spines, the soft part similar to soft dorsal; ventral fins moderate, inserted slightly behind base of pectorals, equidistant from tip of lower jaw and middle of base of anal; pectoral fins rather long, with strongly rounded margin, 1.2 to 1.65 in head.

Color in life dark brown above to rusty underneath; lower part of sides of head and body as well as lower surface of head, chest and abdomen with very dark red, round spots which vary in size, and which are much more distinct on some specimens than on others; a jet black spot on back just below base of first soft rays of the dorsal, usually smaller than pupil; some specimens with several black spots on back below base of dorsal; fins all very dark. In those specimens on which the dark red spots are well defined they are extended on the fins, in others the fins are simply plain, dark brown.

The present collection contains 18 specimens, ranging from 110 to 208 mm. in length. This fish lives among rocks and is difficult to capture without the use of dynamite. It was not seen in the market on the Isthmus. In Cuba it is a food fish of some importance.

Known from Florida south to Brazil. Our specimens are from Toro Point, Colon and Porto Bello.

324. Petrometopon panamensis (Steindachner).

Serranus panamensis Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXII) Ichth. Beitr., IV, 1875, 1, Pl. I, fig. 1 (Panama).

Enneacentrus panamensis Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 398.

Bodianus panamensis Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 378.

Epinephelus panamensis Boulenger, Cat. Fish. Brit. Mus., Ed. II, I, 1895, 177.

Petrometopon panamensis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1141; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 95 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 107 (Panama, Toboguilla Island and Acapulco).

Head 2.55 to 2.75; depth 2.6 to 2.85; D. IX, 14; A. III, 8; scales 79 to 85.

Body oblong, compressed; dorsal profile gently rounded; head large; snout acute, 3.4 to 4.5 in head; eye 4.5 to 5.75; mouth large; lower jaw strongly projecting; maxillary reaching well beyond eye, 1.8 to 1.95 in head; teeth all strongly pointed, in narrow bands, present on jaws, vomer and palatines, the depressible teeth in the jaws enlarged, anterior margin of upper jaw with a single pair of fixed, recurved canines; preopercular margin finely serrate; opercle with 3 flat spines; gill-rakers short, 8 to 10 on lower limb of first arch; lateral line arched, nearly confluent with the outline of back; scales small, finely serrate, those on head and nape more or less imbedded; dorsal fin long, the spines strong, graduated, the soft part with round outline, higher than the spines; caudal fin round; anal with 3 strong spines, the soft part similar to that of the dorsal; ventral fins moderate, inserted a little behind base of pectorals, about equidistant from tip of lower jaw and middle of base of anal; pectorals rather long, round, 1.45 to 1.65 in head.

Color in life very dark red; sides with about 10 dark bars which are faint on upper part of body; no round dark spots; sides of head with more or less distinct bluish spots, most prominent on lips; a dark blotch behind eye sometimes present; fins usually uniform dark brown; the dorsal and anal occasionally with bluish spots at base on interradial membranes; the margins of fins often blue.

This species is represented by 35 specimens, ranging from 46 to 360 mm. in length. It lives among rocks and is seldom taken in seines. We fail to find any structural differences between this species

and *P. cruentatus*. Most specimens can be readily separated by the color, but in others even this is difficult.

Known from Acapulco to Panama. Our specimens are from Balboa and the Panama City market.

127. Genus **Mycteroperca** Gill.

Mycteroperca Gill, Proc. Ac. Nat. Sci. Phila., 1862, 236 (type *Serranus olfax* Jenyns).

Trisotropis Gill, Proc. Ac. Nat. Sci. Phila., 1865, 104 (type *Johnius guttatus* Bloch & Schneider = *Perca venenosa* Linnæus).

Body elongate, compressed; head large, more or less pointed; mouth large, lower jaw prominent.

This genus superficially differs from *Epinephelus* principally in the longer anal fin, there being usually 11 or 12 soft rays.

"The skull differs from that of *Epinephelus* by the wider interorbital area; the parallelism and continuation of the lateral crests forward to the middle of the orbits inclosing an elongate parallelogram, the surface of which, especially between the orbits, is more uniform; the absence of a frontal crest, the simple curvature or straightness of the naso-vomerine ridge, the absence of the angle at the suture between the nasals and the vomer." (Gill.)

KEY TO THE SPECIES.

a. Gill-rakers numerous, close set, about 53 on the lower limb of first arch; outlines of soft dorsal and anal always convex; color brownish; sides with indistinct reticulations of dark around paler areas. *ruber*, p. 445.

aa. Gill-rakers fewer in number, from 8 to 18 on lower limb of first arch.

b. Soft dorsal and anal with convex margins, none of the rays produced; gill-rakers 8 to 11.

c. Gill-rakers about 8; scales in lateral series about 120; general color red or scarlet, with red or black spots. *venenosa apua*, p. 446.

cc. Gill-rakers 10 or 11; scales in lateral series 104 to 115; color brownish, with or without pale reticulations. *bonaci*, p. 447.

bb. Soft dorsal and anal with strongly angulate outlines, some of the rays being produced; gill-rakers 17 or 18.

d. Preopercular margin with an evident notch above its angle; color brownish, everywhere with oblong blackish blotches, with reticulations of ground color between. *boulengeri*, p. 448.

dd. Preopercular margin without evident notch above its angle; color plain dark olivaceous. *xenarcha*, p. 449.

325. Mycteroperca ruber (Bloch).

Epinephelus ruber Bloch, Naturg. Ausl. Fische, VII, 1793, 22, Pl. CCCXXXI ("Japanese seas").

Serranus acutirostris Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 286 (Brazil).

Serranus undulosus Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 295 (Brazil).

Epinephelus chalinius Cope, Trans. Amer. Philo. Soc. Phila., XIV, 1871, 465 (St. Martins).

Mycteroperca rubra Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 372.

Mycteroperca ruber Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1180.

Head. 2.7 to 2.9; depth 2.9 to 3.05; D. XI, 16; A. III, 11 or 12; scales 96 to 115.

Body elongate, rather strongly compressed; anterior profile gently convex; head rather deep; snout moderately acute, 3.26 to 3.65 in head; eye 4.3 to 4.7; mouth large, oblique; lower jaw moderately projecting; maxillary scarcely reaching vertical from posterior margin of eye, 2 to 2.05 in head; teeth small, pointed, mostly in 2 series laterally in the jaws, anteriorly in bands; anterior canines very small, scarcely differentiated; preopercular margin finely serrate, the serræ at angle a little enlarged, a distinct notch above angle; gill-rakers scarcely exceeding the length of pupil, numerous, about 33 on lower limb of first arch; scales small, ctenoid, becoming smooth in advance of dorsal; dorsal fin without notch, the second spine noticeably shorter than the third, the third and fourth spines only slightly longer than the posterior ones, the soft portion of fins higher than the spines, none of the rays produced, the margin convex; caudal fin rounded; anal fin with 3 graduated spines, the soft part higher than the spines, its margin convex; ventral fins a little shorter than the pectorals; pectoral fins long, with round margin, 1.45 to 1.6 in head.

Color in alcohol brownish above, rather pale below; sides with indistinct reticulations of dark around pale areas; lower part of sides sometimes with more or less distinct, dark, wavy, longitudinal lines; fins slightly darker than the body, without distinct markings; ventrals rather darker than the other fins.

This fish is represented by 3 specimens, ranging from 113 to 125 mm. in length. This species appears to be rare on the coast of Panama. It can readily be separated from related species by the large number of gill-rakers.

Known from the Mediterranean Sea and islands of the eastern Atlantic, and on the American shore from the West Indies to Brazil. Our specimens are from Porto Bello.

326. Mycteroperca venenosa apua (Bloch).

Pirati apia Marcgrave, Hist. Nat. Brasil, 1648, 158 (Brazil).

Bonaci cardenal Parra, Desc. Piezas de Hist. Nat., 1787, 29, Pl. XVI (Havana).

Bodianus apua Bloch, Naturg. Ausl. Fische, IV, 1790, 50, Pl. CCXXIX (Brazil).

Johnius guttatus Bloch & Schneider, Syst. Ichth., 1801, 77.

Bodianus marginatus Bloch & Schneider, Syst. Ichth., 1801, 331.

Serranus cardinalis Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 378.

Serranus rupestris Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 437 (San Domingo).

Trisotropis cardinalis Poey, Enumeratio, 1875, 13.

Mycteroperca venenosa guttata Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 375.

Mycteroperca venenosa apua Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 370; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1173.

Head 2.66; depth 3; D. XI, 16; A. III, 11; scales 121.

Body rather short and deep, rather strongly compressed; anterior profile rather strongly and evenly convex; head bluntish; eye small, 5.5 in head; mouth rather large; lower jaw moderately projecting; maxillary reaching past eye, 2.25 in head; teeth moderate, in narrow bands, both jaws with 2 moderate anterior canines; preopercular margin slightly notched, the serræ at angle slightly enlarged; gill-rakers rather few and short, 8 on lower limb of first arch; scales small, chiefly cycloid; dorsal spines rather strong, the second spine as long as the tenth, the third and fourth highest; soft dorsal with gently convex outline; caudal fin slightly concave, the outer rays a little the longer; anal fin high, with convex margin; pectorals about reaching tips of ventrals, 1.75 in head.

Color in life, of an example 750 mm. in length, very dark, sparsely covered with round spots which are black on upper parts and red on

belly; pectorals broadly margined with orange-red, otherwise plain; soft parts of vertical fins largely black. The color appears to vary from dark red to bright red and grayish.

This fish was not seen by us. The above description is from published records. We follow Jordan & Eigenmann in using the trinomial designated by them.

Known from Florida to Brazil. Not as yet recorded from the Isthmus of Panama.

327. Mycteroperca bonaci (Poey).

Serranus bonaci Poey, Memorias, II, 1860, 129 (Cuba).
Serranus brunneus Poey, Memorias, II, 1860, 131 (Havana).
Serranus arara Poey, Memorias, II, 1860, 132 (not of Cuvier & Valenciennes).
Serranus decimalis Poey, Memorias, II, 1860, 138 (Cuba).
Serranus cyclopomatus Poey, Memorias, II, 1861, 353 (Cuba).
Serranus latepictus Poey, Memorias, II, 1861, 353 (Cuba).
Trisotropis aguaji Poey, Repertorio, II, 1868, 229 (Havana).
Trisotropis bonaci Poey, Syn. Pisc. Cub., 1868, 283.
Mycteroperca bonaci Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 370; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1174, Pl. CLXXXVII, fig. 492 (skull only).

Head 2.55 to 3.95; depth 3 to 3.4; D. XI, 16 or 17; A. III, 11 or 12; scales 104 to 115.

Body elongate, compressed; anterior profile gently convex; head rather low; snout acute, 3.2 to 4.2 in head; eye 4.2 to 6.35; mouth large, oblique; lower jaw strongly projecting; maxillary broad, reaching to or a little beyond posterior margin of eye, 1.95 to 2.15 in head; teeth all pointed, present in jaws, vomer and palatines, those in jaws anteriorly in a band, laterally mostly in 2 series, a pair of anterior canines in each jaw, those of the lower very small; nostrils rather close together, subequal; preopercular margin finely serrate, the serræ at the angle scarcely enlarged, a rather distinct notch above angle; gill-rakers rather few, the longest not much more than half the diameter of eye, 10 or 11 more or less developed on lower limb of first arch; scales small, finely ctenoid, becoming smooth anteriorly; dorsal fin long, continuous, without notch, the second spine not much shorter than the third, the soft portion notably higher than the spines, none of the rays produced, its margin convex at all ages; caudal fin rounded in young, slightly emarginate in adult, the upper rays slightly produced, forming an acute angle, the lower lobe round; anal fin with 3 moderate,

graduated spines, the soft rays rather high, none of the rays produced, with convex margin at all ages; ventral fins moderate, a little shorter than the pectorals; pectoral fins reaching tips of ventrals, 1.55 to 1.95 in head.

Color in alcohol dark brown; the young with pale reticulations which are much more pronounced on some specimens than on others, the adults are uniform dark brown. The pectoral fins are somewhat paler than the body and are often marked with pale spots which sometimes form cross-bars. The other fins are all darker than the body, and are narrowly margined with white; the soft dorsal sometimes with a pale stripe on the median part of the rays.

This fish is represented by 31 specimens, ranging from 65 to 460 mm. in length. It is rather common and is of some importance as a food fish on the Atlantic coast of Panama.

Known from Florida to Brazil. Our specimens are from Toro Point, Colon, and Porto Bello.

328. **Mycteroperca boulengeri** Jordan & Starks.

Mycteroperca boulengeri Jordan & Starks, in Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 445, Pl. XXXVIII (Mazatlan); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1171, Pl. CLXXXVII, fig. 490; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 97.

Head 2.8; depth 2.9; D. XI, 16; A. III, 11; scales 108.

Body elongate, moderately compressed; anterior profile gently convex; head rather low; snout moderately acute, 3.5 in head; eye 5.9; mouth moderate, oblique; lower jaw rather strongly projecting; maxillary reaching vertical from posterior margin of pupil, 2.05 in head; teeth all pointed, those on lower jaw at sides mostly in 2 series, elsewhere in narrow bands; upper jaw with 1 or 2 well developed canines anteriorly, those of the lower jaw very small, scarcely differentiated; preopercular margin finely serrate, the serræ at angle slightly enlarged, very slight evidence of a notch above the angle; gill-rakers about ¾ the diameter of eye, 17 on lower limb of first arch; scales small, ctenoid posteriorly, becoming smooth in advance of dorsal; dorsal fin long, without notch, the third and fourth spines a little longer than the posterior ones; the ninth and tenth rays of soft dorsal produced, forming an acute angle; caudal fin slightly emarginate, the upper rays a little produced; anal fin with 3 graduated spines, the median rays produced, forming a sharp angle; ventral fins nearly as long as the pectorals; pectoral fins long, round, failing to reach tips of ventrals, 1.63 in head.

Color in alcohol brownish, everywhere with oblong black markings between which the ground color forms reticulations; a blackish blotch on each side behind maxillary; fins darker than the body; the vertical fins with indications of irregular dark markings.

A single specimen, 272 mm. long, was taken. The species appears to be rare at Panama. Our specimen was taken in a tide stream several miles inland.

Known from Mazatlan to Panama. Our specimen is from Corozal.

329. Mycteroperca xenarcha Jordan.

Mycteroperca xenarcha Jordan, Proc. Ac. Nat. Sci. Phila., 1887 (1888), 387 (James Island, Galapagos); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1180.

Epinephelus xenarchus Boulenger, Cat. Fish. Brit. Mus., Ed. II, I, 1895, 266.

"Head 2⅔; depth 3; eye small, 7 in head. D. XI, 16; A. III, 11; scales 25-110 to 115-50.

"Body rather deep and compressed; head compressed, with rather short, sharp snout, which is 4 in head; profile steep and nearly straight; mouth large, the maxillary reaching scarcely beyond eye, 2 in head; lower canines small; upper canines (2 in number) strong, scarcely directed forward; preorbital narrow, ¾ width of eye; interorbital area convex, its width 4½ in head; nostrils small, the posterior scarcely the larger, separated from the anterior by one diameter; angle of preopercle scarcely salient but provided with coarser teeth; a rather sharp notch above it; opercular spine flat and divided into about 6 teeth at the end; gill-rakers moderate, 9 + 18; scales moderate, scarcely ctenoid; dorsal spines low, the outline of the spinous dorsal gently convex, the fourth spine longest, 3 in head; soft dorsal high, its outline angular, the tenth ray produced, 1⅚ in head; anal fin formed as in *Mycteroperca falcata,* its seventh ray produced and falcate, 1⅘ in head, its posterior outline concave; caudal subtruncate, the outer slightly produced; pectoral 1¾ in head. Color in spirits plain dark olivaceous, the edges of the fins scarcely darker." (Jordan & Evermann.)

This fish was not seen by us. From published accounts it appears to be closely related to *M. boulengeri.*

Recorded from rocky islands on the Pacific coast of Mexico, the Galapagos Islands and from Payta, Peru. Not as yet taken on the coast of Panama.

128. Genus **Promicrops** Poey.

Promicrops Poey, Syn. Pisc. Cub., 1868, 287 (type *Serranus guasa* Poey).

Itaiara Vaillant & Bocourt, Miss. Sci. Méx., etc., Pt. IV, 1878, 70 (type *Serranus itaiara* Lichtenstein=*Perca guttata* Linnæus).

Body elongate, rather robust; cranium broad and depressed between the eyes; upper profile of head more or less concave; scales small, about 100 or more in a lateral series, those of the lateral line each with 4 to 6 radiating ridges; dorsal spines low, XI, 15 or 16 rays present; anal III, 8; ventral fins inserted a little behind base of pectorals.

A single species, reaching a very large size, is known.

330. **Promicrops itaiara** (Lichtenstein).

Serranus itaiara Lichtenstein, Abh. Ak. Wiss. Berlin, 1821, 278 (Brazil).

Serranus galeus Müller & Troschel, in Schomburgk, Reisen in Brit. Guiana, III, 1848, 621; Günther, Cat. Fish. Brit. Mus., I, 1859, 130.

Serranus guasa Poey, Memorias, II, 1860, 141, 354, Tab. 13, fig. 8 (Cuba).

Serranus quinquefasciatus Bocourt, Ann. Sci. Nat., 5 sér., X, 1868, 223 (Nagualate, Pacific coast of Guatemala).

Epinephelus quinquefasciatus Jordan & Gilbert, Bull. U. S. Fish Comm., II, 1882 (1883), 106, 110, 112.

Promicrops guasa Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 542.

Epinephelus galeus Jordan, Proc. Ac. Nat. Sci. Phila., 1883 (1884), 285.

Epinephelus itaiara Jordan, Proc. U. S. Nat. Mus., 1884, 124; Boulenger, Cat. Fish. Brit. Mus., Ed. II, I, 1895, 252.

Promicrops itaiara Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 377; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1900, 3197.

Promicrops guttatus Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 363; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1162, & 1900, 3197, Pl. CLXXXV, figs. 487, 487a, 487b; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 96 (Panama).

Head 2.4 to 2.75; depth 2.85 to 3.4; D. XI, 15 or 16; A. III, 8; scales about 100 to 120.

Body elongate, compressed, becoming more robust with age; profile over head straight or slightly concave; head large, quite broad in adult, narrower in young; interorbital area broad, its width nearly equal to length of snout; snout acute in young, broader in adult, 3.75 to 5 in head; eye 3.4 to 8.2; mouth large, oblique, the lower jaw projecting; maxillary reaching to or beyond vertical from posterior margin of eye, 1.85 to 2.2 in head; teeth all pointed, in bands, present on jaws, vomer and palatines; the depressible teeth in upper jaw scarcely enlarged; usually 2 pairs of small fixed canines on anterior margin of upper jaw; preopercular margin finely serrate, no antrorse spine; opercle with 3 hidden spines; gill-rakers rather short, 9 or 10 more or less developed on lower limb of first arch; scales small, ctenoid; dorsal fin long, the spines strong, increasing in length to the third, the others of about equal length, the soft part higher, with convex margin; caudal fin round, about as long as postorbital part of head and half the eye; anal fin with 3 strong graduated spines, the longest soft rays more than 2 times the length of the longest spine; ventral fins rather small, inserted slightly behind base of pectorals; pectoral fins moderate, broadly rounded, 1.5 to 1.75 in head.

Color of a fresh specimen, 555 mm. long, nearly uniform dark brown, lower parts lighter brown to rusty; head and back with small dark spots; anal and ventrals blue-black, the other fins brown with black spots. Color of fresh specimen, 160 mm. long, back and sides dark brown, lower parts paler brown with a shade of green; head and body with large black spots; sides with 4 or 5 dark cross bands; fins all spotted with black, the ventrals very dark, the other fins olivaceous. The number and intensity of the black spots vary on different individuals. In some specimens the dark spots on lower surface of head and abdomen are replaced by orange spots or blotches. A very small specimen, 38 mm. in length, has no trace of cross-bars, the entire body being profusely spotted with black.

We have 8 specimens, ranging in length from 38 to 555 mm. One of these is from the Pacific and the others are from the Atlantic. A large individual, weighing probably about 100 pounds, was captured in Mindi Cut on the Atlantic side of the Isthmus, but was not preserved. Some of our small specimens were taken from tide pools. Our single Pacific coast specimen was taken in a tide stream.

Known from both coasts of tropical America. Our Atlantic specimens are from Mindi Cut and Colon, the Pacific coast specimen is from Balboa.

129. Genus **Epinephelus** Bloch.

Epinephelus Bloch, Naturg. Ausl. Fische, VII, 1793, 11 (type *Epinephelus marginalis* Bloch=*Perca fasciata* Forskål).

Cerna Bonaparte, Icon. Fauna Ital., Pesce, III, 1837, fasc. 10 (type *Perca gigas* Brünnich=*Labrus guaza* Linnæus).

Cynichthys Swainson, Nat. Hist. & Class. Fish., II, 1839, 201 (type *Perca flava-purpurea* Bennett=*Holocentrus flavo-cæruleus* Lacépède).

Cromileptes Swainson, Nat. Hist. & Class. Fish., II, 1839, 201 (type *Serranus altivelis* Cuvier & Valenciennes).

Hyporthodus Gill, Proc. Ac. Nat. Sci. Phila., 1861, 98 (type *Hyporthodus flavicauda* Gill=*Serranus niveatus* Cuvier & Valenciennes).

Schistorus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 237 (type *Serranus mystacinus* Poey).

Labroperca Gill, Proc. Ac. Nat. Sci. Phila., 1862, 236 (type *Serranus labriformis* Jenyns).

Priacanthichthys Day, Proc. Zoöl. Soc. London, 1868, 193 (type *Priacanthichthys maderaspatensis* Day=*Epinephelus latifasciatus* Temmick & Schlegel).

Hyposerranus Klunzinger, Fische des Rothen Meeres, 1884, 3 (type *Serranus morrhua* Cuvier & Valenciennes).

Body stout, compressed; head rather large, pointed; mouth large; maxillary broad, with a well developed supplemental bone; teeth in bands on the jaws, vomer and palatines; one or both jaws anteriorly with one or two pairs of fixed canines; teeth behind outer series depressible; preopercular margin posteriorly serrate, its lower limb entire, without distinct antrorse hooks; gill-rakers rather short and in moderate numbers; lateral line complete; scales small, ctenoid; dorsal spines 11, occasionally 10, not filamentous; the soft parts of vertical fins usually scaly; caudal fin round or slightly emarginate; anal fin with 3 spines and 7 to 9 soft rays; ventral fins inserted a little behind base of pectorals.

"Cranium narrow above. Parietal crests not produced on frontals which are without transverse ridge posteriorly; frontals with a process or knob on each side behind interorbital area; premaxillary processes fitting into a notch or cavity on the anterior end of the frontals." (Jordan & Evermann).

KEY TO THE SPECIES.

a. Head compressed; interorbital area rather narrow, usually less than diameter of eye.

b. Dorsal spines normally 10; color light brown, everywhere with large round dark spots, extended on fins. *analogus,* p. 454.

bb. Dorsal spines normally 11.

c. Second dorsal spine nearly as long as the third, the posterior spines not noticeably reduced in length; caudal fin with straight or concave margin; color nearly uniform brownish; sides with indistinct pale blotches; several well defined dark dots about the eye. *morio,* p. 455.

cc. Second dorsal spine notably shorter than the third, the posterior spines more or less reduced in length; caudal fin rounded.

d. The posterior nostril notably larger than the anterior; some of the serræ at angle of preopercular margin recurved; color brownish; sides with about 8 dark bars, obscure in preserved specimens; cheek with 3 dark bands. *mystacinus,* p. 455.

dd. Nostrils subequal; no recurved spines at angle of preopercular margin.

e. Scales wanting on maxillary; color in alcohol dark brown, everywhere with large round dark spots extending on fins. *adscensionis,* p. 456.

ee. Maxillary more or less scaly; spots on body smaller or wanting.

f. Anal rays III, 9; dorsal XI, 14 or 15; body with whitish spots, arranged in vertical and horizontal series, none on breast; no cross-bars; saddle-like black blotch on caudal peduncle very large, extending to below lateral line on sides. *niveatus,* p. 458.

ff. Anal rays III, 8; dorsal XI, 16 or 17; saddle-like blotch on caudal peduncle smaller, failing to reach lateral line; cross-bars obscure or wanting.

g. Scales moderate, 94 to 98 in lateral series; no cross-bars; lower parts spotted with white, spots most distinct on lower surface of head; fins all with narrow white margins; no dark spots about the eyes. *labriformis,* p. 459.

gg. Scales smaller, 100 to 120 in lateral series; sides with more or less distinct cross-bars.

h. The soft part of dorsal notably higher than the spines; sides with 5 or 6 dark cross-bars; no red spots; eye surrounded by distinct dark dots. *striatus,* p. 460.

hh. The soft portion of the dorsal lower than the longest spines; sides with 3 or 4 slightly darker shades or bands; body profusely covered with small round red spots; no dark spots about the eye. *guttatus,* p. 461.

aa. Head broad; interorbital area notably wider than eye, 4 to 6 in head; maxillary scaly; scales 86 to 110; dorsal fin rather deeply notched, the spines indifferently 10 or 11; color brown or bluish black, uniform or with a few light spots. *nigritus*, p. 462.

331. Epinephelus analogus Gill.

Epinephelus analogus Gill, Proc. Ac. Nat. Sci. Phila., 1863, 163 (Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1152; Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 2 (Gulf of Panama); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 96 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 107 (Panama).

Serranus courtadei Bocourt, Ann. Sci. Nat., 5 sér., X, 1868, 222 (La Union, San Salvador).

Serranus analogus Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXII) Ichth. Beitr., IV, 1875, 5 (Panama Bay).

Head 2.6 to 2.85; depth 2.8 to 3.25; D. X, 16 to 18; A. III, 8; scales about 100 to 120.

Body elongate, rather slender; profile notably convex over eyes; head rather low and long; snout moderate, 3.65 to 4.9 in head; eye 4.35 to 5.1; mouth large, oblique; lower jaw little projecting; maxillary to or past vertical from posterior margin of eye, 1.95 to 2.1 in head; teeth all pointed, in bands, present on jaws, vomer and palatines; a pair of small, fixed canines present on anterior margin of each jaw; preopercular margin finely serrate, the serræ at angle a little enlarged; gill-rakers moderate, 16 to 18 more or less developed on lower limb of first arch; scales very small, ctenoid, present on maxillaries; dorsal fin long, continuous, the second spine somewhat shorter than the third, of about the same length as the posterior spines, the third and fourth spines the longest, the soft portion of fin a little higher than the spinous part; caudal fin round; anal fin with 3 strong spines, the second and third of about equal length; ventral fins rather small, inserted just behind base of pectorals; pectoral fins round, reaching to or a little past tips of ventrals, 1.7 to 1.85 in head.

Color light brown; body everywhere with round dark spots, which are smallest on head; young with 5 or 6 dark cross-bars; fins rather darker than the body, with numerous black spots, somewhat smaller than those on body.

We have 40 specimens, ranging from 53 to 267 mm. in length. This is one of the important food fishes on the Pacific coast of Panama.

Known from the Pacific coast of Mexico south to the Galapagos and Revillagigedo islands. Our specimens are from Balboa and Panama.

332. Epinephelus morio (Cuvier & Valenciennes).

Serranus morio Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 285 (New York and San Domingo).

Serranus erythrogaster De Kay, Fauna N. Y., Fishes, 1842, 21, Pl. XIX, fig. 52 (Florida).

Serranus remotus Poey, Memorias, II, 1860, 140 (Havana).

Epinephelus morio Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 540; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1160, Pl. CLXXXIV, fig. 485.

Head 2.55 to 2.75; depth 2.6 to 2.8; D. XI, 16; A. III, 8 or 9; scales about 130 to 140.

Body elongate, rather strongly compressed; profile nearly straight over eyes; head moderate; snout slightly acute, 3.4 to 4 in head; eye 3.8 to 4.5; mouth moderate, oblique; lower jaw not strongly projecting; maxillary reaching about to vertical from posterior margin of eye, 1.9 to 2 in head; teeth in narrow bands, present on jaws, vomer and palatines, each jaw with an anterior pair of fixed canines, those of the lower jaw very small; preopercular margin serrate, the serræ at angle somewhat enlarged; gill-rakers rather short, 13 or 14 more or less developed on lower limb of first arch; scales very small, ctenoid, not embedded on head, present on maxillary; dorsal fin long, continuous, the second spine nearly as long as the third, the posterior spine not reduced, the soft portion not much higher than the spines; caudal fin with the posterior margin straight or slightly concave; anal fin with 3 graduated spines, the second spine not much shorter than the third; ventral fins moderate, inserted slightly behind base of pectorals; pectorals rounded, reaching a little beyond tip of ventrals, 1.4 to 1.6 in head.

Color brownish, without distinct markings, except for well defined dark dots about the eye; sides with more or less distinct paler blotches, and sometimes with obscure dark blotches along back; a very indistinct black saddle-like blotch on caudal peduncle; pectoral fins pale, the other fins colored like the body, all narrowly edged with white.

This species is not very abundant on the coast of Panama, but it is occasionally seen in the market. We have 4 specimens, ranging from 145 to 200 mm. in length.

Known from Massachusetts south to Brazil. Our specimens are from Colon.

333. Epinephelus mystacinus (Poey).

Serranus mystacinus Poey, Memorias, I, 1851, 52, Pl. X, fig. 1 (Cuba).

Schistorus mystacinus Poey, Repertorio, 1868, 154.

Epinephelus mystacinus Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 383; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1151; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 132 (Colon).

Head 3.4; depth 2.9; D. XI, 15; A. III, 9; scales about 120.

Body oblong, rather deep, compressed; anterior profile convex and not steep; head large; snout obtuse; eye large, 4.5 in head; mouth moderate; lower jaw projecting; maxillary reaching under posterior margin of eye, 2.25 in head; teeth strong, those in lower jaw mostly in 2 series, those in upper jaw in a band; anterior canines small, those of the upper jaw shorter than the depressible teeth, those of the lower jaw scarcely differentiated; posterior nostril larger than the anterior, nearly round; preopercular margin rather strongly serrate, not emarginate, the serræ at angle considerably enlarged, some of the lower ones usually recurved; gill-rakers short and thick, about 15 more or less developed on lower limb of first arch; scales rather small, mostly ctenoid, none on maxillary; dorsal spines rather strong and high, the first spine nearly half the length of the second, the latter considerably higher than the tenth, the third spine longest, second fourth, fifth and sixth but little shorter, soft dorsal rather high; caudal fin rounded; anal rounded, second anal spine as long as the third but stronger; ventrals rather long; pectoral fins reaching slightly beyond tips of ventrals, 1.66 in head.

Color in life dull olive brown to grayish brown; sides with 8 darker bars, the one on caudal peduncle broadest and darkest on upper surface of tail; cheeks with 3 dark bands; dorsal dull olive, the bands of the sides extending on the scaly parts; caudal and anal dull olive; ventrals blackish; pectorals light olive brown. The bars on sides and cheeks become faint in spirits.

This fish was not seen by us. The above description is compiled from published accounts and is here included because the range of the species brings it within the scope of present work.

Known from the West Indies to Brazil.

334. Epinephelus adscensionis (Osbeck).

Trachinus adscensionis Osbeck, Reise Ost.—Ind. China, Ed. II, 1765, 388 (Ascension Island).

Trachinus punctatus Bonnaterre, Tableau Encyclo., Ichth., VI, 1788, 46.

Perca stellio Walbaum, Artedi Piscium, Pt. III, 1792, 349.

Holocentrus punctatus Bloch, Naturg. Ausl. Fische, IV, 1790, 88, Pl. CCXLI.

Perca maculata Bloch, Naturg. Ausl. Fische, VI, 1792, 92, Pl. CCCIII (Antilles).

Trachinus osbeck Lacépède, Hist. Nat. Poiss., II, 1800, 364.

Sparus atlanticus Lacépède, Hist. Nat. Poiss., IV, 1803, 156, Pl. V, fig. 1 (Martinique).

Serranus nigriculus Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 375 (Martinique).

Serranus pixanga Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 383.

Serranus aspersus Jenyns, Zoöl. Voy. Beagle, Fishes, 1842, 6 (Porto Praya, St. Jago, of the Cape Verde Islands).

Serranus impetiginosus Müller & Troschel, in Schomburgk, Hist. Barbados, 1848, 665 (Barbadoes).

Serranus maculatus Peters, Monatsb. k. Ak. Wiss. Berlin, 1865 (1866), 109.

Serranus varius Bocourt, Ann. Sci. Nat., 5 sér., X, 1868, 222 (Gulf coast of Mexico).

Epinephelus punctatus Poey, Enumeratio, 1875, 16.

Epinephelus atlanticus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 918 & 973.

Epinephelus ascensionis Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 391.

Epinephelus aspersus Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 358.

Epinephelus adscensionis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1152, Pl. CLXXXII, fig. 482.

Head 2.65; depth 3; D. XI, 17; A. III, 8; scales 91.

Body elongate, compressed; profile nearly straight over eyes; head long and low; snout acute, 3.95 in head; eye 4.8; mouth large, oblique; lower jaw strongly projecting; maxillary reaching a little beyond eye, 1.95 in head; teeth in bands, present on jaws, vomer and palatines, a pair of fixed canines present on anterior margin of each jaw; preopercular margin finely serrate, the serræ at angle scarcely enlarged; gill-rakers short, 16 more or less developed on lower limb of first arch; scales moderate, ctenoid, partly embedded in advance of dorsal and on head, wanting on maxillary; dorsal fin long, the second spine much shorter than the third, the third or fourth the longest, the posterior ones slightly reduced in length, the soft portion higher than the spines; caudal fin round; anal fin with 3 strong spines, the second and third spines of about equal length; ventral fins rather small, inserted slightly behind the base of the pectorals; pectoral fins broadly rounded, reaching a little beyond tip of ventrals, 1.8 in head.

Color in alcohol very dark brown above, lighter brown below; everywhere with large round dark spots which become very obscure on upper portion of sides and head; a saddle-like black blotch present on caudal peduncle. Fins colored like the body, all with a pale margin; base of dorsal and anal with white spots which are partly on the fins and partly on the body. The dark spots are more or less distinctly visible on all of the fins except the dorsal.

This fish is represented by a single specimen 333 mm. in length.

Known from southern Florida south to Brazil. Also recorded from the African shore. Our specimen was taken at Porto Bello.

335. Epinephelus niveatus (Cuvier & Valenciennes).

Serranus niveatus Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 380 (Brazil).

Serranus margaritifer Günther, Cat. Fish. Brit. Mus., I, 1859, 131 (South America).

Serranus conspersus Poey, Memorias, II, 1860, 139 (Cuba).

Hyporthodus flavicauda Gill, Proc. Ac. Nat. Sci. Phila., 1861, 98 (Newport, Rhode Island; young).

Epinephelus niveatus Poey, Syn. Pisc. Cub., 1868, 286; Boulenger, Cat. Fish. Brit. Mus., Ed. II, I, 1895, 225, Pl. III, fig. B; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1156.

Head 2.33; depth 2.9; D. XI, rarely X, 14 or 15; A. III, 9; scales about 115 to 120.

Body oblong, compressed; anterior profile a little convex; snout short, rather acute, 3.75 in head; eye rather large; mouth large; lower jaw rather strongly projecting; maxillary reaching vertical from posterior margin of eye, 2 in head; opercular margin serrate, the serræ at angle enlarged, with slight emargination above angle; gill-rakers moderate, about 15 more or less developed on lower arm of first arch; scales rather small; dorsal spines rather high, the fourth 2.6 in head; soft dorsal of moderate height; caudal fin truncate; anal moderate, second spine as long as third, 2.7 in head; ventrals nearly as long as pectorals; pectoral fins not reaching to tips of ventrals, 1.9 in head.

Color of young brown; body with round whitish spots rather smaller than the pupil, regularly arranged in vertical and horizontal series, about 5 in horizontal and 4 in vertical series, these rows sometimes showing irregularities; no distinct spots on breast; a very large black blotch on upper surface of caudal peduncle, extending to below lateral line on sides; fins nearly plain; dorsal with a median row of round dusky spots on membranes.

This fish was not seen by us. The above description is compiled from published accounts, and is here included because the range of the species places it within the scope of the present work.

Known from the West Indies to Brazil.

336. Epinephelus labriformis (Jenyns).

Serranus labriformis Jenyns, Zoöl. Voy. Beagle, Fishes, 1842, 8, Pl. III (Galapagos Islands); Günther, Cat. Fish. Brit. Mus., I, 1859, 152.

Epinephelus sellicauda Gill, Proc. Ac. Nat. Sci. Phila., 1862, 250 (Cape San Lucas).

Epinephelus ordinatus Cope, Trans. Amer. Philo. Soc. Phila., XIV, 1871, 466 (Panama).

Serranus sellicauda Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXII) Ichth. Beitr., IV, 1875, 5 (Panama).

Epinephelus labriformis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1155; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 96 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 108 (Acapulco; Panama; Toboguilla, Perico and Chatham islands).

Head 2.4 to 2.8; depth 2.7 to 3; D. XI, rarely X, 16 or 17; A. III, 8; scales about 94 to 98.

Body rather deep, compressed; profile over eyes gently convex; head large; snout acute, 3.5 to 4.7 in head; eye 4.2 to 5.1; mouth large, oblique; lower jaw moderately projecting; maxillary reaching to or past vertical from posterior margin of eye, 1.9 to 2.1 in head; teeth all pointed, in bands, present on jaws, vomer and palatines; a pair of small fixed canines present on anterior margin of each jaw; preopercular margin serrate, the serræ at angle slightly enlarged; gill-rakers short, 14 to 16 more or less developed on lower limb of first arch; scales moderate, ctenoid, imbedded on head, present on maxillaries; dorsal fin continuous, the second spine notably shorter than the third, the third and fourth the longest, the posterior spines considerably shorter, the soft portion somewhat higher than the spines; caudal fin slightly round; anal fin with 3 rather short strong spines, the second and third of about equal length; ventral fins moderate, inserted just behind base of pectorals; pectoral fins rather large, rounded, reaching to or slightly past tips of ventrals, 1.5 to 1.8 in head.

Color dark brown; lower parts spotted with white, these spots most distinct and best defined on lower surface of head; a dark blotch on upper surface of caudal peduncle present; fins colored like the body, all with narrow white margins; the white spots of body continued on

pectorals, ventrals, anal and caudal, much more distinct in some specimens than others, occasionally wholly wanting.

This fish is represented by 29 specimens, ranging in length from 50 to 378 mm. This is one of the important food fishes in the Panama market.

Known from Acapulco, Mexico, south to the coast of Peru. Our specimens are from Taboga Island, Balboa and Panama.

337. Epinephelus striatus (Bloch).

Anthias striatus Bloch, Naturg. Ausl. Fische, VI, 1792, 92, Pl. CCCXXIV (Atlantic Ocean; based on a figure by Plumier).

Anthias cherna Bloch & Schneider, Syst. Ichth., 1801, 310 (Cuba).

Sparus chrysomelanus Lacépède, Hist. Nat. Poiss., IV, 1803, 160 (Martinique).

Serranus striatus Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 288.

Epinephelus striatus Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 356; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1157, Pl. CLXXXIII, fig. 483; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 132 (Colon).

Head 2.6 to 2.8; depth 2.7 to 2.9; D. XI, rarely XII, 16 or 17; A. III, 8; scales about 100 to 112.

Body elongate, compressed; profile over eyes slightly convex; head rather deep; snout acute, 3.45 to 4.5 in head; eye 3.8 to 5; mouth large, oblique, the lower jaw not very strongly projecting; maxillary reaching nearly or quite to vertical from posterior margin of eye, 2 to 2.2 in head; teeth in bands, present on jaws, vomer and palatines; anterior canines small, present only in upper jaw; preopercular margin finely serrate, the serræ at angle scarcely enlarged; gill-rakers short, 15 or 16 more or less developed on lower limb of first arch; scales small, ctenoid, present on maxillary; dorsal fin continuous, the second spine only a little shorter than the third, longer than the posterior spines, the soft portion notably higher than the spines; caudal fin with gently rounded margin; anal fin with 3 strong spines, the second one not much shorter than the third; ventral fins moderate, inserted a little behind base of pectorals; pectoral fins round, reaching to or slightly beyond tips of ventrals, 1.4 to 1.55 in head.

Color dark brownish above, paler below; sides with 5 or 6 indistinct dark cross bars; a very distinct black blotch on upper surface of caudal peduncle; black dots present about eye; sides of head sometimes with obscure dark stripes, the one running from eye to upper angle of gill-

opening visible in all specimens at hand; fins all dark gray or brown at base, more or less clouded, the distal parts paler.

This species is represented by 11 specimens, ranging from 40 to 257 mm. in length. It is not abundant, but is occasionally seen in the market. No large individuals were seen.

Known from North Carolina south to Brazil. Our specimens are from Colon and Porto Bello.

338. Epinephelus guttatus (Linnæus).

Perca guttata Linnæus, Syst. Nat., Ed. X, 1758, 292 (Brazil?).

Serranus catus Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 373 (Martinique).

Serranus arara Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 377 (Havana).

Serranus lunulatus Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 378 (Havana; after Parra).

Serranus angustifrons Steindachner, Verh. Zoöl.-Bot. Ges. Wein, XIV, 1864, 230, Pl. VII, figs. 2 & 3 (Cuba).

Epinephelus cubanus Poey, Repertorio, 1867, 202 (Cuba).

Epinephelus lunulatus Poey, Syn. Pisc. Cub., 1868, 286.

Epinephelus guttatus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 919; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1900, 3197; Evermann & Marsh, Bull. U. S. Fish Comm., XX, Part 1, 1900 (1902), 153, Pl. XIII (Porto Rico).

Epinephelus apua Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 389.

Dermatolepis angustifrons Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 375.

Epinephelus catus Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 355.

Epinephelus maculosus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1158, & 1900, 3197.

Head 2.5; depth 3.33; D. XI, 16; A. III, 8; scales about 100 to 120.

Body rather slender, moderately compressed; anterior profile evenly and gently convex; head rather long; snout acute, 4.3 in head; eye 4.3; mouth not very large; lower jaw little projecting; maxillary reaching below posterior margin of eye, 2.33 in head; teeth rather strong, both jaws with 2 moderate, curved canines, those in the upper jaw largest; preopercular margin serrate, the serræ at angle enlarged, a slight emargination above angle; gill-rakers slender, longer than gill-fringes, 15 to 17 more or less developed on lower limb of first arch; scales moderate, rather strongly ctenoid; dorsal spines rather slender, the

second spine considerably higher than the tenth, the third and fourth longest, the soft rays lower than the highest spines; caudal fin round; anal fin rather high, the second anal spine somewhat stronger than the third and rather longer; ventrals short; pectorals rather narrow, reaching past tips of ventrals, 1.66 in head.

Color in life yellowish olive above, whitish below; three broad, oblique, obscure bands of olive running upward and backward on sides; spots on body vivid scarlet red, those above a little darker, the edges of scales brown; belly spotted; dorsal olive yellow, somewhat clouded, a few red spots on spinous dorsal; soft dorsal broadly edged with black; caudal yellowish, the posterior half black, its edge white; anal like soft dorsal; ventrals red, blackish at tips; pectorals light yellow, with rows of scarlet spots. The olive bands on sides disappear in spirits, and the red spots above become brown, those below gray.

This fish was not seen by us. The above description was compiled from published records, and is here included because the range of the species places it within the scope of the present work.

Known from South Carolina to Brazil. Common in the West Indies.

339. Epinephelus nigritus (Holbrook).

Serranus nigritus Holbrook, Ichth. South Carolina, Ed. I, 1855, 173, Pl. XXV, fig. 2 (Charleston).

Centropristis merus Poey, Syn. Pisc. Cub., 1868, 288 (Cuba).

Cerna sicana Doderlein, Giorn. Sci. Nat. Palermo, XVI, 1882, 82 (Palermo).

Epinephelus nigritus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 540; Boulenger, Cat. Fish. Brit. Mus., Ed. II, I, 1895, 238.

Epinephelus merus Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 362.

Garrupa nigrita Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1161.

Head 2.5; depth 2.2 to 3; D. X or XI, 14 or 15; A. III, 9; scales 86 to 110.

Body very robust; head broad; eye small, 6 to 8 in head; interorbital broad, 4 to 6 in head; mouth large; lower jaw projecting; maxillary scaly, reaching beyond eye, 2 in head; teeth in broad bands; canines strong, but growing smaller with age; preopercular margin rounded, with enlarged serræ at angle, the lower one usually directed downward; gill-rakers very short and thick, the longest not twice as long as broad, 12 to 14 on lower limb of first arch; scales ciliated; dorsal fin notched,

the second, or second and third, spines longest, 2 or 3 in head; caudal fin rounded; second anal spine shorter than the third, 6 in head.

Color brown or bluish black, uniform or with a few light spots, the lower parts scarcely paler; a dark streak above maxillary; the distal part of vertical fins darker.

This fish was not seen by us, but it is widely distributed and may be expected on the Atlantic coast of Panama. It reaches a large size, a length of 2 meters and a weight of 500 pounds having been reported. The above description was compiled from published accounts of the species.

Known from South Carolina to Brazil and the Mediterranean.

130. Genus **Alphestes** Bloch & Schneider.

Alphestes Bloch & Schneider, Syst. Ichth., 1801, 236 (type *Alphestes afer* Bloch & Schneider).

Prospinus Poey, Memorias, II, 1861, 388 (type *Plectropoma chloropterum* Cuvier & Valenciennes).

Body oblong, compressed; frontal bones with an excavation for the reception of the posterior processes of the premaxillaries; a strong antrorse spine present at lower posterior angle of preopercle; dorsal rays XI, 17 to 20; anal III, 9; ventral fins inserted a little behind base of pectorals.

KEY TO THE SPECIES.

a. Color dark brown, sides clouded with dark blotches; no well defined dark spots; a dark stripe from eye to upper angle of gill-opening; pectoral fins nearly uniform brownish, without dark bars; anterior profile slightly concave behind eyes; gill-rakers short, not more than ½ the length of gill-filaments. *afer*, p. 463.

aa. Color dark brown, head and body densely covered with round dark spots, forming longitudinal stripes posteriorly; no black stripe back of eye; pectoral fins with about 5 dark cross-bars; anterior profile gently convex; gill-rakers slightly longer, about ⅔ the length of gill-filaments. *multiguttatus*, p. 464.

340. Alphestes afer (Bloch). (Plate XLIII.)

Epinephelus afer Bloch, Naturg. Ausl. Fische, VII, 1793, 12, Pl. CCCXXVII (Acara, Guinea).

Alphestes afer Bloch & Schneider, Syst. Ichth., 1801, 236; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1164, Pl. CLXXXVI, figs. 488, 488a.

Plectropoma chloropterum Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 398 (San Domingo; Martinique).

Plectropoma monacanthus Müller & Troschel, in Schomburgk, Hist. Barbados, 1848, 665.

Prospinus chloropterus Poey, Syn. Pisc. Cub., 1868, 289.

Head 2.95; depth 2.7; D. XI, 18; A. III, 9; scales about 80.

Body oblong, compressed; dorsal profile slightly concave from eyes to dorsal; head rather long and low; snout moderately acute, 4.65 in head; eye 4.3; mouth moderate, oblique, lower jaw projecting; maxillary scarcely reaching vertical from posterior margin of eye, 2.07 in head; teeth all pointed, in narrow bands, present on jaws, vomer and palatines; the depressible teeth in anterior part of upper jaw only slightly enlarged; the anterior pair of fixed canines in upper jaw extremely small; preopercular margin finely serrate, the antrorse spine at lower angle short and strong; opercle with 3 flat spines, all except the middle one hidden in the skin; gill-rakers short, the longest not over half the length of the gill-fringes, 15 more or less developed on lower limb of first arch; scales small, finely ctenoid, those on head and nape apparently more exposed than in *A multiguttatus;* dorsal fin long, the spines strong, increasing in length to the third, the others of about equal length, the soft part higher than the spines, with broadly rounded outline, the longest rays equal in length to postorbital part of head; caudal fin round; anal fin with 3 strong spines, the second one failing to reach the tip of the third when deflexed; ventral fins moderate, failing to reach vent, inserted slightly behind base of pectorals, about equidistant from tip of lower jaw and middle of base of anal; pectorals moderate, round, 1.43 in head.

Color in alcohol dark brown above, somewhat paler below; sides with indistinct dark blotches; lower parts with lighter areas; no distinct spots anywhere; a dark stripe extending from eye to upper angle of gill-opening; fins brownish, the ventral fins darkest, with pale blotches, the vertical fins with indefinite dark markings.

This species appears to be rare on the coast of Panama. A single specimen, 205 mm. long, was seined from Fox Bay, Colon.

Known from the West Indies to Brazil; also recorded from the Falkland Islands. Our specimen is from Colon.

341. Alphestes multiguttatus (Günther). (Plate XLIV.)

Plectropoma multiguttatum Günther, Proc. Zoöl. Soc. London, 1866, 600 (Panama).

Plectropoma afrum Günther, Trans. Zoöl. Soc. London, VI, 1869, 411, Pl. LXVII, fig. 3 (Panama; not of Bloch).

Epinephelus multiguttatus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 625; Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 2 (Gulf of Panama).

Alphestes multiguttatus Jordan & Gilbert, Bull. U. S. Fish Comm., II, 1882 (1883), 107, 110; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1165; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 96 (Panama Bay); Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 409 (Panama).

Head 2.6 to 2.85; depth 2.6 to 3.05; D. XI, 18 to 20; A. III, 9; scales about 70 to 80.

Body oblong, compressed; dorsal profile anteriorly gently convex; head long, rather low; snout acute, 4.75 to 5.3 in head; eye 3.7 to 4.65; mouth large, oblique; lower jaw strongly projecting; maxillary extending a little beyond eye in adult, not quite so far back in young, 2.05 to 2.2 in head; teeth all pointed, in narrow bands, present on jaws, vomer and palatines; the movable teeth in anterior part of upper jaw only slightly enlarged, a pair of short fixed canines on margin of jaw in advance of the depressible teeth; preopercular margin finely serrate, with a well developed antrorse spine at its lower posterior angle in adult, young with bifurcate spine at angle, the anterior fork developing into the antrorse spine of the adult; opercle with 3 flat spines; gill-rakers of moderate length, the longest about ⅔ the length of gill-fringes, 13 to 15 on lower limb of anterior arch; scales small, ctenoid, difficult to enumerate, those on head and nape more or less embedded; dorsal fin long, the spines increasing in length from the first to the third, the others of about equal length or decreasing slightly in length posteriorly, the soft part higher than the spines, with convex margin, the longest ray a little shorter than postorbital part of head; caudal fin round; anal with 3 strong spines, the second rarely reaching the tip of the third when deflexed; ventral fins rather small, failing to reach vent in adult, to or past vent in very young, inserted slightly behind base of pectorals, about equidistant from the tip of lower jaw and middle of base of anal; pectorals moderate, outline round, the lower rays the shortest, 1.35 to 1.65 in head.

Color dark brown; head and body densely covered with round dark spots, often arranged so as to form more or less distinct rows of stripes on caudal peduncle; lower parts of head and body usually without spots; young with fewer spots, mostly confined to head, the rest of body with wavy longitudinal streaks. Pectoral fins yellowish, with about 5 dark cross-bands; the other fins usually plain olive or brown, rarely with a few indistinct spots; caudal with a very narrow pale margin.

The Panama collection contains 94 specimens, ranging from 45 to 255 mm. in length. This fish is common about the rocky shores of the small islands in Panama Bay. The young are frequently taken in tide pools. It is often seen in the market and is of some importance as a food fish. This species may be distinguished from *A. afer* by the color, the general contour of the body and the slightly longer gill-rakers.

Known from Mazatlan to Lobos de Afuera, Peru. Our specimens are from Naos Island, Balboa and Panama.

131. Genus **Paralabrax** Girard.

Paralabrax Girard, Proc. Ac. Nat. Sci. Phila., 1856, 131 (type *Labrax nebulifer* Girard).

Atractoperca Gill, Proc. Ac. Nat. Sci. Phila., 1861, 164 (type *Labrax clathratus* Girard).

Gonioperca Gill, Proc. Ac. Nat. Sci. Phila., 1862, 236 (type *Serranus albomaculatus* Jenyns).

Body robust; mouth large; small lateral canines present, no depressible teeth; preopercle with posterior margin serrate, the lower limb entire; scales small, ctenoid; some of the anterior dorsal spines considerably elevated; dorsal rays usually X, 14; anal III, 7; caudal fin always lunate; ventral fins inserted a little behind base of pectorals.

One species of this genus of food fishes has been recorded from the Pacific coast of Panama.

342. Paralabrax humeralis (Cuvier & Valenciennes).

Serranus humeralis Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 246 (Chile).

Serranus albomaculatus Jenyns, Zoöl. Voy. Beagle, Fishes, 1842, 3, Pl. II (Galapagos Archipelago); Steindachner, (Sitzb. k. Ak. Wiss. Wein, LXXII) Ichth. Beitr., IV, 1875, 4, Pl. I, fig. 2 (Panama).

Serranus semifasciatus Guichenot, in Gay, Hist. Fisc. Polit. Chile, Zoöl., II, 1848, 151, Pl. I bis., fig. 2 (Juan Fernandez).

Percichthys godeffroyi Günther, Jour. Mus. Godeffroy, I, Pt. II, 1873, 97 (Iquique, Peru).

Paralabrax albomaculatus Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 181.

Paralabrax humeralis Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 389; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1196, Pl. CXC, fig. 499 (skull only).

Head 2.6 to 3.25; depth 3.25 to 4; D. X, 13 or 14; A. III, 7; scales 85 to 100.

Body rather robust, compressed; anterior profile nearly straight over eyes; head moderate; snout acute, 3.15 in head; eye 5 to 6; mouth moderate; lower jaw projecting; maxillary reaching to or a little beyond vertical from middle of eye, 2.33 in head; canines small or wanting; preopercular margin finely serrate, the serræ at angle somewhat enlarged; gill-rakers long, 18 or 19 on lower limb of first arch; scales small, ctenoid; dorsal fin rather deeply notched, the second spine not more than half the length of the third, the third and fourth the longest; caudal fin rather deeply emarginate; anal fin short, the second and third spines of about equal length; ventrals inserted slightly behind base of pectorals, shorter than pectorals; pectoral fin rounded, 1.5 to 1.66 in head.

Color dark above, paler below; sometimes with small light spots on head and sides, and with traces of dark cross-bars; fins dusky, pectorals lighter, sometimes with faint mottlings. Some specimens have a lateral series of rather large light spots.

This species was not seen by us. It was once recorded from Panama Bay by Steindachner, but has not been seen by recent investigators. The above description is compiled from published accounts.

Known from Panama to Peru.

132. Genus **Hypoplectrus** Gill.

Hypoplectrus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 236 (type *Plectropoma puella* Cuvier & Valenciennes).

Body deeper and more compressed than in allied genera; head rather short, tapering; mouth moderate; the maxillary not reaching beyond eye; the lower margin of preopercle distinctly serrate; scales moderate, ctenoid; dorsal fin with 10 spines; caudal fin more or less emarginate; anal fin with 3 spines and 7 or 8 soft rays; ventral fins inserted a little behind base of pectorals.

KEY TO THE SPECIES.

a. Scales rather large, 42 to 45 in lateral series; gill-rakers short, about 8 on lower limb of first arch; outline of soft dorsal angulate in adult. *lamprurus*, p. 468.

aa. Scales smaller, about 69 in lateral series; gill-rakers longer, about 11 on lower limb of first arch; outline of soft dorsal convex. *unicolor*, p. 469.

343. Hypoplectrus lamprurus (Jordan & Gilbert). (Plate XLV.)

Serranus lamprurus Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 322 (Panama Bay).

Hypoplectrus lamprurus Jordan, Proc. U. S. Nat. Mus., 1885, 376; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1190.

Head 2.6; depth 2.1 to 2.6; D. X, 14; A. III, 8; scales 42 to 45.

Body rather short and deep; anterior profile rather steep, slightly concave over eyes; head moderate; snout acute, 3 to 3.7 in head; eye 3.25 to 3.55; mouth moderate, a little oblique; lower jaw scarcely projecting; maxillary scarcely reaching opposite middle of eye, 2.25 to 2.5 in head; teeth all pointed, in bands on jaws, vomer and palatines; anterior margin of each jaw with several enlarged teeth, the upper one with a distinct pair of canines; preopercular margin finely serrate, the serræ at angle scarcely enlarged, a slight notch above angle; opercle with a broad flat point, no distinct spines; gill-rakers short and slender, about 8 more or less developed on lower limb of first arch; scales rather large, strongly ctenoid; dorsal fin continuous, the spines strong, the third and fourth spines the longest, a little longer than the posterior spines, the soft part short, slightly angulate in our largest specimen; caudal fin slightly emarginate; anal fin with 3 strong spines, the second and third of about equal length, the soft part higher, with convex margin; ventral fins long, equal to length of pectorals; pectoral fins rather short, pointed, 1.44 to 1.6 in head.

Color of our largest specimen, 85 mm. long, dark brown; faint dark stripes along the rows of scales; 2 pearly lines back of eye and scattered pearly spots on nape and sides; dorsal fin black at base, distal parts of soft dorsal pale; caudal fin black at base, then abruptly yellowish; anal and ventrals mostly black; pectoral fins plain translucent. Smaller specimens, 38 to 50 mm. long, are paler and have 2 dark stripes back of eye and no pearly stripes or spots; the fins are all translucent. Very young of 25 mm. and less in length are slightly paler and have 6 distinct pale cross-bars on sides.

We have 12 specimens at hand, ranging from 20 to 85 mm. in length. The largest one was taken by us and the others were sent by Mr. Robert Tweedlie. These appear to be the only specimens known besides the type. The serrations on lower limb of preopercle are very distinct even in the young of 20 mm.

Recorded only from the Pacific coast of Panama. The specimens at hand are from Chame Point.

344. Hypoplectrus unicolor (Walbaum).

Perca unicolor Walbaum, Artedi Piscium, Pt. III, 1792, 352 (locality unknown).

Holocentrus unicolor Bloch & Schneider, Syst. Ichth., 1801, 322.

Serranus unicolor Boulenger, Cat. Fish. Brit. Mus., Ed. II, I, 1895, 299.

Hypoplectrus unicolor Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1190.

Head 2.7; depth 2.05; D. X, 15; A. III, 7; scales 69.

Body short and deep; anterior profile steep, gently concave over eyes; head moderate; snout pointed, 3.2 in head; eye 3.65; mouth moderate, oblique; lower jaw slightly projecting; maxillary reaching opposite middle of eye, 2.05 in head; teeth pointed, in bands, the anterior teeth in outer series somewhat enlarged, no distinct canines; preopercular margin finely serrate, the serræ at and below angle slightly enlarged, a slight notch above angle; opercle with a distinct flat spine and a short flat point above it and below it; gill-rakers short, 11 on lower limb of first arch; scales small, ctenoid; dorsal fin continuous, the first 3 spines graduated, the remainder of about equal length; the soft dorsal scarcely higher than the spines, the margin convex; caudal fin distinctly emarginate; first anal spine short, the second and third of about equal length, somewhat shorter than the soft rays, the outline of fin convex; ventral fins rather large, but shorter than the pectorals; pectoral fins long and rather narrow, rounded, 1.1 in head.

Color reddish brown, a little paler below than above; sides of snout with several bluish spots; a narrow bluish band from lower anterior margin of orbit, backward and downward to lower margin of preopercle; another narrow bluish band from lower posterior margin of orbit toward angle of preopercle; about 3 dark vertical lines on opercle, the anterior one partly under margin of preopercle, extending on side of chest to base of ventral; a black blotch or band on caudal peduncle; ventral fins dark; dorsal and anal light greenish yellow; pectorals a little paler; caudal fin bright golden.

We have one specimen, 115 mm. in length, which we refer to the color variety described by Cope under the name, *Plectropoma crocota* (Trans. Amer. Philo. Soc. Phila., XIV, 1871, p. 466). We have another specimen which is probably nearest to *Plectropoma accensum* (Poey, Memorias, I, 1851, 72). This specimen is also 115 mm. in length and agrees well with the foregoing, except in color and in the apparently more elongate body, the depth being contained 2.45 in the length.

Its color is nearly uniform brownish, the sides of head being slightly yellowish. There are no distinct markings anywhere. The dorsal and anal fins are dusky, the caudal fin is olivaceous, the ventral fins are black and the pectoral fins are light yellow.

The species, *H. unicolor,* is recorded from Florida and the West Indies. A large variation in color seems to have led to the naming of several species, representing, however, only different color patterns. The species is known from Florida, the West Indies and Grenada. Our specimens are from Colon and Porto Bello.

133. Genus **Prionodes** Jenyns.

Prionodes Jenyns, Zoöl. Voy. Beagle, Fishes, 1842, 46 (type *Prionodes fasciatus* Jenyns).

Body elongate, moderately compressed; head rather long and low; mouth large; maxillary not scaly and without a supplemental bone; teeth present in jaws, vomer and palatines, none of the teeth in jaws depressible; preopercular margin serrate, the serræ not in clusters; gill-rakers usually few; lateral line complete; dorsal fin with about 10 spines and 11 to 13 soft rays; caudal fin lunate or truncate; anal fin small, with 3 slender spines; ventrals close together, inserted slightly in advance of pectorals. The species of this genus are of small size, most of them being brightly colored. The single species known from Panama occurs on the Pacific coast.

345. **Prionodes fasciatus** Jenyns.

Prionodes fasciatus Jenyns, Zoöl. Voy. Beagle, Fishes, 1842, 46 (Chatham Island, Galapagos); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1212; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 98.

Serranus psittacinus Valenciennes, Voy. Vénus, Zoöl., 1846, Pl. I, fig. 1, text, 1855, 290 (Galapagos Islands); Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 407; Boulenger, Cat. Fish. Brit. Mus., Ed. II, I, 1895, 295.

Centropristis psittacinus Günther, Cat. Fish. Brit. Mus., I, 1859, 86.

Serranus calopteryx Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 350 (Mazatlan), and 1882, 625 (Panama; Pearl Islands).

Head 2.7 to 2.8; depth 2.9 to 3.5; D. X (rarely IX), 12 or 13; A. III, 7; scales above lateral line 46 to 49.

Body elongate, moderately compressed; the back little elevated; head rather long and low; snout pointed, 3.3 to 5 in head; eye 4 to 4.65; mouth rather large, oblique, the lower jaw strongly projecting; maxillary reaching to or past posterior margin of pupil, 2.15 to 2.3 in head; teeth in the jaws in villiform bands, a few in anterior part of upper jaw and a few of the lateral ones in lower jaw somewhat enlarged; vomerine teeth in a triangular-shaped patch; palatine teeth in short bands; preopercular margin finely serrate, none of the serræ enlarged; gill-rakers very short, 7 or 8 more or less developed; scales rather small, 10 oblique rows on cheeks, 4½ rows between the lateral line and base of spinous dorsal; dorsal fin long, the median spines slightly longer than the posterior ones, the soft part higher than the spines; caudal fin slightly lunate, the upper rays the longest; anal fin with 3 rather strong spines, the second and third of about equal length, not much shorter than the fourth dorsal spine, the soft portion short, very high; ventral fins rather long, inserted midway between the tip of lower jaw and origin of anal; pectoral fins moderate, 1.3 to 1.4 in head.

Color in alcohol brown above, paler below; sides with an indefinite horizontal streak extending from snout through eye and along side, disappearing posteriorly, always most distinct in young; sides also with about 12 more or less distinct cross-bars; in some specimens these bars are broken along middle of side and a row of black spots appears along the abdomen and lower edge of the tail; a small black spot at base of pectoral and one in front of ventral, and 2 or 3 similar black spots between and in front of the bases of these fins; chin and cheek usually with black blotches or bars; dorsal fin rather dark brown, usually with a row of 3 roundish black spots about as large as pupil on anterior half of the soft part of the dorsal fin, the posterior rays with many small black dots; in specimens in which the large black spots are missing on the dorsal, the entire distal part of the fin is densely speckled with black; caudal fin with a black base, which color extends on the outer rays of the fin, the median rays more or less spotted with black; anal and ventrals dusky to nearly black, slightly speckled in the light colored specimens; pectoral fins colorless.

The present collection contains 6 specimens, ranging in length from 52 to 148 mm. The specimens at hand were all taken along the shores of rocky islands near Balboa.

Known from Cape San Lucas south to the Galapagos Islands and the coast of Peru. Our specimens are from Balboa.

134. Genus **Diplectrum** Holbrook.

Diplectrum Holbrook, Ichth. South Carolina, Ed. I, 1855, 32 (type *Diplectrum fasciculare* Holbrook = *Perca formosa* Linnæus).

Haliperca Gill, Proc. Ac. Nat. Sci. Phila., 1862, 236 (type *Serranus bivittatus* Cuvier & Valenciennes = *Serranus radialis* Quoy & Gaimard).

Body elongate, more or less compressed; preopercle armed with 1 or 2 clusters of strong, divergent spines, these most prominent in adult; smooth area on top of head large, extending backward to a line connecting borders of opercles; lateral line complete; dorsal fin low, with 10 slender spines; caudal fin posteriorly deeply concave to slightly forked; anal fin with 3 rather weak spines; ventral fins inserted a little in advance of pectorals, the latter unsymmetrically rounded.

KEY TO THE SPECIES.

a. Serræ on margin of preopercle in two clusters, radiating from two centers; scales small, 74 to 80 in a horizontal series above lateral line, 11 or 12 oblique rows on cheeks; sides of head with from 3 to 6 horizontal bands. *formosum*, p. 473.

aa. Serræ on margin of preopercle radiating from a single center; scales larger, fewer than 74 in a lateral series and fewer than 11 oblique rows on cheeks.

b. Anal fin constantly with 8 soft rays; base of soft dorsal with a black bar. *euryplectrum*, p. 474.

bb. Anal fin constantly with 7 soft rays; base of soft dorsal without black bar.

c. Body rather deep, depth 3.3 to 4.5 in length; scales moderate, about 56 in lateral series; 6 oblique rows on cheeks. *macropoma*, p. 475.

cc. Body not as deep, depth 3.5 to 4.15 in length; scales rather smaller, 60 to 69 in lateral series; more than 6 oblique rows on cheeks.

d. Eye large, 3.1 to 3.6 in head; 5½ horizontal rows of scales between lateral line and base of spinous dorsal; 8 or rarely 9 oblique rows on cheeks; caudal spot small, not broader than lateral band. *radiale*, p. 475.

dd. Eye smaller, 3.9 to 4.5 in head; 6½ horizontal rows of scales between lateral line and base of spinous dorsal; 9 or 10 oblique rows on cheeks; caudal spot large, notably broader than lateral band. *pacificum* sp. nov., p. 477.

346. Diplectrum formosum (Linnæus).

Perca formosa Linnæus, Syst. Nat., Ed. XII, 1766, 488 (Carolina).

Epinephelus striatus Bloch, Naturg. Ausl. Fische, VII, 1793, 20, Pl. CCCXXX (Jamaica).

Serranus radians Quoy & Gaimard, in Freycinet, Voy. Uranie et Physicienne, Zoöl., 1824, 313, Pl. LVIII, fig. 2 (Montevideo[?]).

Serranus irradians Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 244 (Montevideo).

Serranus fasciculars Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 245, Pl. XXX (Brazil).

Centropristis radians Günther, Cat. Fish. Brit. Mus., I, 1859, 83.

Centropristis fasciculars Günther, Cat. Fish. Brit. Mus., I, 1859, 83.

Diplectrum fasciculare Holbrook, Ichth. South Carolina, Ed. II, 1860, 35.

Serranus formosus Jordan, Proc. U. S. Nat. Mus., 1884, 35.

Diplectrum formosum Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 397, Pl. LXV; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1207, Pl. CXCI, fig. 502.

Head 2.9 to 4.15; depth 3.55 to 4.75; D. X, 11 or 12; A. III, 7; scales above lateral line 74 to 80.

Body very elongate, compressed; the back little elevated; head rather large; snout moderate, 3.35 to 4 in head; eye 3.6 to 4.3; mouth large, oblique; the lower jaw slightly projecting; maxillary reaching slightly past middle of eye, 2.15 in head; teeth as in *D. radiale*; preopercular margin strongly serrate, the serræ with 2 diverging centers, one at the lower angle of the preopercle and the other above it, not very evident in young; gill-rakers scarcely as long as pupil, 10, exclusive of 1 or 2 rudiments, on lower limb of first arch; scales small, ctenoid, 11 or 12 oblique rows on cheeks; about 20 scales on median line in advance of dorsal, 7½ rows between the lateral line and the base of spinous dorsal; dorsal fin continuous, the median spines slightly longer than the posterior ones, the soft part slightly higher than the spines, the last rays the longest; caudal fin posteriorly deeply concave, the outer rays of each lobe produced in adult; anal fin with 3 weak spines, the soft portion shorter but similar to the dorsal in form; ventrals moderate, inserted slightly nearer the origin of the anal than tip of lower jaw; pectoral fins rather long, 1.4 to 1.5 in head.

Color in alcohol brownish above, pale below; young with 3 horizontal dark bars on back and sides; the adult without evident dark bands but with faint cross-bars; sides of head and snout with 3 to 5

dark horizontal bands; a small black spot present at base of the upper lobe of caudal fin. The fins in preserved specimens are unmarked.

This fish was not taken by us. It is here included because it has been recorded from localities both north and south of the Isthmus of Panama and, therefore, coming within the range of the present work. The above description is based on specimens from the eastern coast of the United States, ranging in length from 100 to 195 mm.

Known from North Carolina south to Uruguay.

347. Diplectrum euryplectrum Jordan & Bollman.

Diplectrum euryplectrum Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 157 (off coast of Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1206; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 98.

Head 2.5 to 2.8; depth 3.3 to 3.5; D. X, 12; A. 8; scales above lateral line 67 to 69.

Body very elongate, compressed; the back scarcely elevated; head rather large; snout short, 4 in head; eyes 3.6 to 3.8; mouth large, oblique, the lower jaw scarcely projecting; maxillary reaching to or a little past posterior margin of pupil, 2 in head; teeth as in *D. radiale;* preopercular margin serrate, with a single broad cluster of diverging spines; gill-rakers slender, slightly longer than eye, 12 to 15 on lower limb of first arch; scales small, ctenoid, 8 oblique series on cheeks; about 16 scales in advance of dorsal, 6½ rows between the lateral line and base of spinous dorsal; dorsal fin long, the median spines the longest, the soft rays all of about equal length; caudal fin deeply concave, the upper rays the longer; anal fin with 3 small graduated spines, the soft portion similar to that of the dorsal; ventral fins rather small, inserted slightly nearer the origin of anal than tip of lower jaw; pectoral fins rather long, 1.4 to 1.55 in head.

Color in spirits brownish above, pale below; sides with slightly darker bars; base of caudal with a dark blotch; margin of spinous dorsal dusky, the base of the soft dorsal with a dark bar; fins otherwise plain translucent.

This species was not taken by us. It was dredged in moderately deep water in Panama Bay by the Albatross in 1888. It does not seem to frequent the shores. The above description is based on specimens ranging in length from 135 to 155 mm.

Known only from Panama Bay.

348. Diplectrum macropoma (Günther).

Centropristis macropoma Günther, Proc. Zoöl. Soc. London, 1864, 145 (Panama), and Trans. Zoöl. Soc. London, VI, 1869, 409, Pl. LXV, fig. 1.

Diplectrum macropoma Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 157; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1205.

Head 2.9 to 3; depth 3.3 to 3.5; D. X, 12; A. III, 7; scales above lateral line 56.

Body elongate, compressed; the back little elevated; head rather large; snout moderate, 4.1 to 4.2 in head; eye 3.7 to 4.15; mouth large, oblique, terminal, or the lower jaw slightly projecting; maxillary reaching nearly to posterior margin of eye, 2 to 2.1 in head; teeth as in *D. radiale;* preopercular margin with a single center of radiating serræ; gill-rakers equal to or larger than pupil, 9 or 10, exclusive of 1 or 2 rudiments, on the lower limb of the first arch; scales moderate, ctenoid, 6 oblique rows on cheeks; 12 to 14 scales on median line in advance of dorsal, 4½ rows between the lateral line and base of spinous dorsal; dorsal fin continuous, the median spines longer than the posterior ones, the soft part with a nearly straight margin, the last rays longest; caudal fin posteriorly concave, the upper rays the longest; anal fin with 3 graduated spines, the soft portion rather high; ventral fins moderate, inserted a little nearer origin of anal than tip of lower jaw; pectoral fins rather long, 1.2 to 1.3 in head.

Color of preserved specimens brownish above, pale below; upper parts with faint, dark cross-bars; a dark caudal spot present; preorbital with pale spots; fins colorless.

This fish was not taken by us. It is here described from specimens taken off the coast of Panama, Colombia and Ecuador, ranging in length from 120 to 205 mm.

Known from the Gulf of California south to Ecuador.

349. Diplectrum radiale (Quoy & Gaimard). (Plate XLVI, fig. 1.)

Serranus radialis Quoy & Gaimard, in Freycinet, Voy. Uranie et Physicienne, Zoöl., 1824, 316 (Rio de Janeiro).

Serranus bivittatus Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 241 (Martinique).

Centropristis ayresi Steindachner, (Sitzb. k. Ak. Wiss. Wien, LVII) Ichth. Notizen, VII, 1868, 1, Pl. I, fig. 1 (Santos, Brazil).

Centropristis radialis Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXII), Ichth. Beitr., IV, 1875, 6 (Panama Bay).

Haliperca bivittata Poey, Syn. Pisc. Cub., 1868, 282.

Diplectrum radialis Streets, Bull. U. S. Nat. Mus., VII, 1878, 52.

Diplectrum radiale Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1204.

Head 2.5 to 3.1; depth 3.85 to 4.3; D. X, 11 or 12; A. III, 7; scales above lateral line 60 to 68.

Body elongate, little compressed; the back not elevated; head rather large and low; snout short, 3.6 to 4.4 in head; eye very large, 3.1 to 3.6; mouth large, oblique; lower jaw projecting; maxillary reaching middle of eye, 2 to 2.25 in head; teeth in the jaws in villiform bands, some of the outer ones in each jaw somewhat enlarged; vomerine teeth in a triangular patch; palatine teeth in very narrow bands; preopercular margin serrate, the spines longest at the lower posterior angle; gill-rakers scarcely as long as pupil, 10 or 11, exclusive of a few rudiments, on lower limb of first arch; scales rather small, ctenoid; 8 or rarely 9 oblique rows of scales on cheeks, 15 or 16 scales on median line in advance of dorsal, 5½ horizontal rows between the lateral line and base of spinous dorsal; dorsal fin long, continuous, the spines pungent, the third or fourth slightly longer than the succeeding ones, the soft part a little higher than the spinous portion, its margin slightly convex; caudal fin slightly forked, the upper lobe the longer; anal fin with 3 rather small graduated spines, the soft portion short but similar in shape to that of the dorsal; ventral fins rather large, inserted about midway between the tip of lower jaw and origin of anal; pectoral fins rather long, 1.33 to 1.5 in head.

Color in alcohol of young up to 80 mm. in length, brown above, paler below; back and side with 3 dark horizontal stripes, one from nape to base of anterior dorsal spines, the next one from upper margin of eye to base of last rays of dorsal, the third, the broadest and most distinct, extending from snout through eye to base of caudal; sides also with indications of dark cross-bars; caudal spot indistinct, not wider than the lateral band, and not much darker; a small black spot at base of upper rays of caudal and another preceding it on median line of caudal peduncle; the caudal fin occasionally with one or two other small black spots; dorsal and caudal a little dusky, the other fins plain translucent.

This species is represented by 24 specimens in the present collection, ranging in length from 35 to 80 mm. Young of this species are rather

common in shallow water on the Atlantic coast of Panama. The adults were not seen.

Known from Cuba to Brazil. Our specimens are from Colon and Porto Bello.

350. Diplectrum pacificum sp. nov. (Plate XLVI, fig. 2.)

Diplectrum radiale Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 97 (not of Quoy & Gaimard); Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 409 (Panama).

Type No. 81756, U. S. N. M.; length 92 mm.; Naos Island, Panama.

Head 2.9 to 3.15; depth 3.5 to 4.05; D. X, 11 or 12; A. III, 7; scales above lateral line 60 to 69.

Body very elongate, compressed; the back scarcely elevated; head rather large and low; snout short, 3.4 to 4 in head; eye moderate, 3.9 to 4.5; mouth large, slightly oblique, lower jaw projecting; maxillary reaching to or past posterior margin of pupil, 2.1 to 2.6 in head; teeth as in *D. radiale;* preopercular margin serrate, the serræ with single diverging center at angle, greatly enlarged in adult; gill-rakers quite as long as pupil, 10 or 11, exclusive of rudiments, on lower limb of first arch; scales rather small, ctenoid, 9 or 10 oblique rows on cheeks; 16 to 18 scales on median line in advance of dorsal, 6½ horizontal rows between lateral line and base of spinous dorsal; dorsal fin long, the fourth spine usually the longest, the soft part with convex margin; caudal fin slightly forked, the upper lobe the longer; anal fin with 3 weak spines, the soft portion shorter but similar to that of the dorsal; ventral fins moderate, inserted about midway between the tip of lower jaw and origin of anal; pectoral fins rather long, 1.25 to 1.5 in head.

Color in alcohol slightly brownish above, pale or slightly silvery below; the young with the same color pattern as in *D. radiale,* with the dark bands, particularly the one on median line of sides, notably blacker and more distinct. The caudal spot is much larger, more distinct and broader than the lateral band. The black spots on upper surface of caudal peduncle and on the base of the caudal fin are also more distinct than in *D. radiale.* The soft dorsal and caudal are slightly barred with dusky. The longitudinal stripes disappear with age, but indistinct dark bars and a large caudal spot remain.

Of this species 20 specimens were preserved, ranging in length from 42 to 213 mm. This fish is of some value as food and is rather frequently seen in the Panama City market. The Atlantic and Pacific coast forms have for a long time been considered identical. However,

a comparison of our specimens reveals several rather small, but apparently constant, differences. Unfortunately, we have no large specimens from the Atlantic, so that the comparison here given is that of the young. The differences in color are pointed out in the above description. Besides this, it is noted that the Pacific coast form has a smaller eye, usually one or two more oblique rows of scales on the cheeks and one more horizontal row between the lateral line and base of spinous dorsal.

All of the Pacific representatives previously identified as *D. radiale* are doubtlessly referable to this species. The range would then extend from Lower California to Panama. Our specimens are from Naos Island and the Panama City market.

135. Genus **Rhegma** Gilbert.

Rhegma Gilbert, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1900, 3169 (type *Rhegma thaumasium* Gilbert).

Body moderately elongate, compressed; head rather short, blunt; mouth large; lower jaw scarcely in advance of the upper; maxillary broad, with narrow supplemental bone; teeth all in broad villiform bands; gill-covers above posterior angle attached to shoulder girdle by membrane; preopercle with a single broad spine; opercle without spines; pseudobranchiæ well developed; lateral line interrupted under posterior part of soft dorsal, reappearing lower down on median line of side; scales thin, weakly ctenoid, of moderate size, not embedded; dorsal fin low, normally with about 7 spines; caudal fin rounded; anal fin with 3 short spines; ventrals small, inserted slightly in advance of pectorals.

A single species of this genus is known.

351. **Rhegma thaumasium** Gilbert.

Rhegma thaumasium Gilbert, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1900, 3170 (Panama); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 99, Pl. XV, fig. 31 (Panama); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 111 (Toboguilla Island).

Head 3 to 3.2; depth 2.8 to 3.2; D. VII (rarely VIII), 20 to 24; A. III, 17 to 20; scales 48 to 55.

Body elongate, compressed; anterior profile rather steep, nearly straight over eyes; head short; snout blunt, 4.8 to 6.3 in head; eye 4.3 to 4.7; mouth large, slightly oblique; the lower jaw scarcely projecting; maxillary reaching far beyond eye, 1.7 to 1.85 in head;

teeth all small, in broad villiform bands on jaws, vomer and palatines; anterior nostril with a short tube; a short supraoccular flap present; preopercle with a single broad spine; opercle without spines; gill-rakers very short, 6 or 7 more or less developed on lower limb of first arch; lateral line interrupted under base of last rays of dorsal, reappearing on median line of side, considerably in advance of point of interruption; scales of moderate size, weakly ctenoid, becoming smooth anteriorly, present on base of fins; dorsal fin low, the spines graduated, the soft part a little higher, some of the posterior rays slightly produced, the margin angulate; caudal fin shorter than head, rounded; anal fin with 3 spines, the second one notably larger than the others, the soft part similar to that of the dorsal; ventral fins small, inserted slightly in advance of base of pectorals, only slightly more than half as long as pectorals; pectoral fins moderate, round, about equal to length of head.

Color very dark brown above, paler below, other specimens lighter brown; a large round black spot on opercle; sides of head usually with 2 black lines, a broad one extending from eye to opercular blotch and a narrower one from above maxillary to margin of preopercle; in the lighter colored specimens there are faint dark stripes along the rows of scales; fins very dark, the vertical ones narrowly margined with white.

Twelve specimens, ranging from 58 to 98 mm. in length, were taken by the use of dynamite along the rocky shores of some small islands near Balboa. Our specimens appear to agree in all respects with the figure published by Gilbert & Starks, except that in our specimens the third anal spine and the ventral fins appear notably smaller than represented in the figure.

Known only from Panama. Our specimens are from Balboa.

136. Genus **Rypticus** Cuvier.

Soapfishes.

Rypticus Cuvier, Règne Animal, Ed. II, II, 1829, 144 (type *Anthias saponaceus* Bloch & Schneider).

Smecticus Valenciennes, Voy. Vénus, Zoöl., 1855, 305 (type *Smecticus bicolor* Valenciennes).

Eleutheractis Cope, Trans. Amer. Philo. Soc. Phila., XIV, 1871, 467 (type *Eleutheractis coriaceus* Cope).

Body elongate, compressed; head rather small, pointed; mouth large, oblique; lower jaw projecting; maxillary broad, with a supplemental bone; teeth all small, in villiform bands on jaws, vomer and palatines, no canines; preopercular margin provided with 2 or 3 teeth, otherwise

smooth; opercle with 2 or 3 spines; gill-rakers short; lateral line normal; scales minute, embedded; dorsal fin with 2 or 3, rarely 4, short spines, the second dorsal rather long, of 20 or more rays; caudal rounded; anal rather long, with soft rays only; ventrals very small, I, 5 rays, inserted a little in advance of pectorals; pectorals moderate, round. Three rather closely related species are represented in the Panama collection.

KEY TO THE SPECIES.

a. Dorsal spines normally 3.

b. Body slender, the depth not exceeding the length of head, 3.65 in length of body; preopercle with only 2 spines.
saponaceus, p. 480.

bb. Body deeper, the depth greater than length of head; 2.7 in length of body; preopercle with 3 spines. *xanti*, p. 481.

aa. Dorsal spines normally 2; body slender, the depth scarcely exceeding length of head, 3.1 to 3.5 in length of body; preopercle with 2 spines and occasionally a rudiment of a third.
nigripinnis, p. 482.

352. Rypticus saponaceus (Bloch & Schneider). (Plate XLVII.)

Anthias saponaceus Bloch & Schneider, Syst. Ichth., 1801, 310 (Havana).

Rhypticus microps Castelnau, Anim. Nouv. Rares Amér. Sud, 1855, 6 (Bahia).

Rypticus saponaceus Cuvier & Valenciennes, Hist. Nat. Poiss., III, 1829, 63; Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 340; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1232.

Rhypticus saponaceus Günther, Cat. Fish. Brit. Mus., I, 1859 172.

Rypticus arenatus Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 402 (Colon).

Head 3.65; depth 3.65; D. III, 20; A. 13; scales 140.

Body very elongate; the back little elevated; anterior profile concave over eyes; head rather small; snout acute, 5.25 in head; eye small, 5.05 in head; interorbital narrow, only about half the eye; mouth rather large, oblique; lower jaw strongly projecting; maxillary reaching vertical from posterior margin of eye, 2.2 in head; teeth all small, pointed, in rather broad bands on jaws, vomer and palatines; preopercular margin convex, with 2 rather prominent spines, the lower one the larger; opercle with 3 spines, the median one the largest;

gill-rakers scarcely as long as pupil, about 8 on lower limb of first arch; scales very small, embedded, present on base of all the vertical fins; dorsal fin with 3 very short and well separated spines, the last one at least an eye's diameter in advance of soft dorsal; soft dorsal moderately thickened by skin at base, the rays difficult to enumerate, posterior margin of fin convex; caudal fin with strongly convex margin; anal fin similar to soft dorsal, although shorter; ventral fins small, inserted a little in advance of pectorals, half as long as pectorals; pectoral fins moderate, round, 1.57 in head.

Color in alcohol very uniform dark above, brownish below; lower surface of head lighter brown; the vertical fins black, with a very narrow pale margin; pectorals and ventrals a little paler than other fins.

A single specimen, 150 mm. long, was taken. Upon it we have based the above description. This fish was seined from a very muddy pool on the Panama Canal, several miles from the shore. When captured, it was densely coated with mucus, which, together with the smooth skin, gives the fish the characteristic soapy feeling from whence the members of the genus have received the name, "Soapfishes."

Known from western Africa and on the American coast from Florida to Brazil. Our specimen is from Mindi.

353. Rypticus xanti Gill. (Plate XLVIII.)

Rhypticus xanti Gill, Proc. Ac. Nat. Sci. Phila., 1862, 250 (Cape San Lucas).

Rypticus xanti Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1231.

Head 3 to 3.1; depth 2.7; D. III, 20 to 24; A. 16; scales about 125.

Body rather deep; anterior profile concave over eyes; head small, low; snout acute, 4.35 to 4.4 in head; eye 4.75 to 5.5; interorbital a little more than half the diameter of eye; mouth large, oblique; lower jaw strongly projecting; maxillary reaching beyond eye, 2.2 in head; teeth small, pointed, in broad bands on jaws, vomer and palatines, no canines; preopercular margin with 3 spines, the upper one very short, the lower one largest; opercle with 3 spines, the median one notably enlarged; gill-rakers about as long as pupil, 7 more or less developed on lower limb of first arch; scales small, embedded; dorsal fin with 3 distinct spines, well separated from the soft dorsal; soft dorsal and anal greatly thickened at base by skin and scales, the rays very difficult to enumerate, each fin with convex outline; caudal fin strongly convex; ventral fins inserted a little in advance of base of pectorals, slightly

more than half the length of pectorals; pectoral fins rather short, rounded, 1.77 in head.

Color in alcohol very dark gray above, brownish below; sides with small irregular and indistinct lighter brown blotches; fins all darker than the body, very narrowly edged with white.

We have 2 specimens, 195 and 203 mm. long, which we refer to this species. They differ from all other specimens collected by us on the Pacific coast of Panama in having a notably deeper and more robust body, 3 distinct dorsal spines, and in the excessively thickened base of the soft dorsal and anal fins. The third preopercular spine is short but distinct, in the other specimens it is obsolete.

Known from Mazatlan to Panama. Our specimens are from Chame Point and from a tide pool at Panama City.

354. Rypticus nigripinnis Gill.

Rhypticus nigripinnis Gill, Proc. Ac. Nat. Sci. Phila., 1861, 53 (Panama).

Rhypticus maculatus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 251 (Cape San Lucas).

Promicropterus decoratus Gill, Proc. Ac. Nat. Sci. Phila., 1863, 164 (Panama).

Rhypticus decoratus Günther, Trans. Zoöl. Soc. London, VI, 1869, 412.

Rypticus nigripinnis Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 339; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1234; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 100 (Panama Bay); Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 410 (Panama).

Head 3 to 3.35; depth 3.1 to 3.5; D. II, 24 to 26; A. 14 to 16; scales about 140.

Body elongate, rather strongly compressed; anterior profile straight over eyes; head moderate; snout short, pointed, 5.1 to 6 in head; eye 4.45 to 5.75; interorbital space narrow, half the eye in specimens 180 mm. in length, not broader than pupil in young (45 mm. long); mouth large, oblique; lower jaw strongly projecting; maxillary reaching to or a little beyond vertical from posterior margin of eye, 2.15 to 2.3 in head; teeth all small, in broad villiform bands on jaws, vomer and palatines, no canines; preopercular margin with 2 spines and sometimes a slight rudiment of a third, the lower spine the larger; opercle with 3 distinct spines, the middle one the largest; gill-rakers not longer than pupil, 7 or 8 more or less developed on lower limb of first arch; scales very small, embedded; dorsal fin with 2 short, stiff spines, not separate from

the soft dorsal; soft dorsal and anal greatly thickened by skin and scales, each with strongly convex margin posteriorly; caudal fin strongly convex; ventral fins small, inserted a little in advance of pectorals, about half as long as pectorals; pectoral fins moderate, rounded, 1.6 to 1.8 in head.

Color very dark brownish above, paler brown below; sides with paler spots, these very indistinct in our largest specimen, but prominent and much more numerous in the smaller ones; young of 80 mm. and less in length with a pale median stripe from snout to origin of dorsal, and with 2 narrower pale stripes behind eye, the spaces between these pale stripes rather darker than ground color of body; fins uniform, rather darker than body, spotted like the body in very young.

This species is represented by 20 specimens, ranging from 33 to 188 mm. in length. It is not rare and is occasionally seen in the market. Most of our specimens were taken from rocky tide pools, but it also inhabits other localities, as one of our specimens was taken in a very muddy bayou several miles inland.

Known from Cape San Lucas to Panama. Our specimens are from Corozal, Balboa and Panama City.

Family LII. **Lobotidæ.**

The Triple-tails.

Body oblong, compressed; the back elevated; anterior profile concave; head moderate; snout short; eye small, anteriorly placed; mouth moderate, oblique; the lower jaw projecting; teeth in the jaws pointed, small, none on vomer or palatines; preopercle serrate; scales of moderate size, rather strongly ctenoid; dorsal fin long, continuous, with about 12 strong spines, the soft part elevated; caudal fin rounded; anal fin with 3 graduated spines, the soft part similar to that of dorsal and opposite it.

This family is composed of a single genus and few species.

137. Genus **Lobotes** Cuvier.

Lobotes Cuvier, Règne Animal, Ed. II, II, 1829, 177 (type *Holocentrus surinamensis* Bloch).

The characters of this genus are included in the family description.

KEY TO THE SPECIES.

a. Preopercular margin moderately serrate, the serræ at angle not notably enlarged, always shorter than pupil; soft dorsal with 15 rays. *pacificus*, p. 484.

aa. Preopercular margin strongly serrate, the serræ at angle much enlarged, longer than pupil; soft dorsal with 16 rays. *surinamensis*, p. 485.

355. Lobotes pacificus Gilbert. (Plate XLIX.)

Lobotes auctorum Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXII) Ichth. Beitr., IV, 1875, 6 (Panama; not of Günther).

Lobotes surinamensis Jordan & Gilbert, Bull. U. S. Fish Comm., II, 1882 (1883), 110 (Panama; not of Bloch); Jordan, Proc. U. S. Nat. Mus., 1885, 378 (not of Bloch); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1235 (part; not of Bloch); Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 2 (Rio Tuyra; not of Bloch).

Lobotes pacificus Gilbert, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 2857 (Panama); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 100, Pl. XIV, fig. 28 (Panama).

Head 2.7 to 2.95; depth 1.8 to 2.3; D. XII, 15; A. III, 11; scales 45 to 50.

Body deep, compressed; the back elevated; anterior profile strongly concave over eyes, strongly convex at nape; head moderate; snout tapering, 4.25 to 5.6 in head; eye small, 3.5 to 8.5 in head; interorbital broad; mouth moderate, oblique; lower jaws projecting; maxillary reaching verticle from middle of eye, 2.6 to 3.4 in head; teeth in the jaws rather small, pointed, an outer irregular series, with a band of minute teeth behind it; preopercular margin serrate, the serræ at angle never noticeably enlarged, always less than half the length of pupil, the serræ on lower limb very short, not recurved; scales moderate, strongly ctenoid, wanting only on snout, extending on base of vertical fins; dorsal spines strong, the median ones longest, the soft part of fin much higher, its outer margin strongly convex; caudal fin rounded; anal spines graduated, the soft part similar to that of the dorsal; ventral fins long, pointed, equal to or longer than head to preopercular margin; pectoral fins very short, 1.95 to 2.05 in head.

Color dark brown to pale brown, with more or less silvery, at least below lateral line; an indistinct dark band from eye to occiput, 2 narrower bands or lines extending backward for a short distance from interorbital, another band from lower margin of eye to angle of pre-

opercle; all the fins, except dorsal, darker than the body, the caudal fin with an abruptly pale margin in young, which is not present in adult; pectoral fins plain translucent.

This species is represented by 52 specimens, ranging in length from 20 to 298 mm. Most of the specimens are small and were taken at Chame Point by Mr. Robert Tweedlie, and no large specimens were observed. It is occasionally seen in the market.

Known from the west coast of Panama. Our specimens are from Chame Point, Taboga and Naos islands, and from the Panama City market.

356. Lobotes surinamensis (Bloch). (Plate L.)

Holocentrus surinamensis Bloch, Naturg. Ausl. Fische, IV, 1790, 98, Pl. CCXLIII (Surinam).

Bodianus triourus Mitchill, Trans. Lit. & Phil. Soc. N. Y., I, 1815, 418 (Powles Hook, N. J.).

Lobotes somnolentus Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 324 (San Domingo).

Lobotes auctorum Günther, Cat. Fish. Brit. Mus., I, 1859, 338 (in part).

Lobotes surinamensis Holbrook, Ichth. South Carolina, Ed. II, 1860, 169, Pl. XXIV, fig. 2; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1235, Pl. CXCIV, fig. 510 (in part; not of Bloch).

Head 2.6 to 2.9; depth 1.8 to 2; D. XII, 16; A. III, 11; scales 45.

Body oblong, compressed; anterior profile deeply concave; head rather small; snout short, 4.1 to 5 in head; eye rather small, 4 to 6 in head; mouth moderate, oblique; the lower jaw projecting; maxillary scarcely reaching middle of eye, 2.6 to 3 in head; teeth small, pointed, with an irregular outer series and a band of minute teeth behind it; preopercular margin strongly serrate, the serræ at angle much enlarged, longer than pupil, the serræ above angle directed more or less upward and those on the lower limb downward and forward; scales moderate, strongly serrate, wanting only on snout; dorsal spines strong, the median ones very slightly longer than the posterior ones, the soft part of fin much higher, strongly convex to slightly pointed; caudal fin rounded; anal fin with 3 strong graduated spines, the soft part of fin similar to that of the dorsal and opposite it; ventral fins long, pointed, exceeding length of head to preopercular margin; pectoral fins very short, 1.8 to 2.1 in head.

Color dark chocolate brown to pale brown with more or less silvery; a dark band from eye to nape; 2 narrower bands from interorbital

toward nape, another band from lower margin of eye to angle of preopercle; all the fins, except pectorals, darker than the body; the caudal fin with a broad yellow margin; pectoral fins plain translucent.

This fish appears to be rather rare on the coast of Panama, as only 3 specimens, ranging from 60 to 178 mm. in length, were secured. It is rarely seen in the market. This species may be distinguished from the Pacific coast form by the much stronger serrations on the preopercular margin, and the soft dorsal appears to have constantly one more ray. All of our specimens from the Atlantic coast have 16 soft rays in the dorsal fin and all the specimens (20) from the Pacific coast, which we have examined in regard to the number of dorsal rays, have 15. That the body is deeper, the head longer and broader, and the scales more strongly serrate than in *L. pacificus,* as stated by Gilbert & Starks, we are unable to verify. There is considerable variation in color, but there are apparently no constant differences between the 2 species in this respect.

Known from Massachusetts south to Uruguay. Our specimens are from Mindi Cut and the Colon market.

Family LIII. **Priacanthidæ.**

The Big-eyes.

Body oblong, compressed; head deep; snout short; eye very large; mouth large, very oblique; the lower jaw projecting; teeth in villiform bands on jaws, vomer and palatines; posterior nostril slit-like, close to the eye; preopercle serrate, with one or more spines at angle; opercle short, ending in 2 or 3 points; gill-membranes separate, free from the isthmus, the rakers long; pseudobranchiæ large; branchiostegals 6; lateral line continuous, not extending on caudal fin; scales small, firm, ctenoid, extending forward on head, snout and maxillaries, not extending on base of vertical fins; dorsal fin continuous, with about 10 spines; anal fin with 3 spines; ventral fins thoracic, with I, 5 rays; the fins usually rough with small serræ.

KEY TO THE GENERA.

a. Scales small, 80 to 100 in lateral series; body elongate, its depth not half the length; soft dorsal and anal each with 12 to 15 rays. *Priacanthus,* p. 487.

aa. Scales larger, 35 to 50 in lateral series; body deep, its depth more than half its length; soft dorsal and anal each with 9 to 11 soft rays. *Pseudopriacanthus,* p. 489.

138. Genus **Priacanthus** Oken.

Priacanthus Oken, Isis, 1817, 1183 (type *Anthias macropthalmus* Bloch).

Body oblong, the depth less than half the length; preopercle with a well developed flat spine at angle; lateral line extending strongly upward and backward from upper angle of gill-opening to anterior dorsal spines, then following curvature of back; scales small, 80 to 100 in lateral series; dorsal rays X, 13 or 14; anal III, 13 to 15.

KEY TO THE SPECIES.

a. Ventral fins very long, about as long as head, inserted in advance of base of pectorals; opercular margin with a single small indentation a little above and behind tip of preopercular spine; gill-rakers long, 22 to 23 on lower limb of first arch. *arenatus*, p. 487.

aa. Ventral fins rather short, much shorter than head, inserted under base of pectorals; opercular margin with 2 distinct indentations, a small one above and behind tip of preopercular spine and a larger U-shaped one under tip of preopercular spine; gill-rakers fewer, 16 to 18 on lower limb of first arch. *cruentatus*, p. 488.

357. **Priacanthus arenatus** Cuvier & Valenciennes. (Plate LI.)

Priacanthus arenatus Cuvier & Valenciennes, Hist. Nat. Poiss., III, 1829, 97 (Brazil; Atlantic); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1237, Pl. CXCV, fig. 511.

Priacanthus macracanthus Cuvier & Valenciennes, Hist. Nat. Poiss., III, 1829, 97 (not of Bloch).

Priacanthus catalufa Poey, Proc. Ac. Nat. Sci. Phila., 1863, 182 (Havana).

Head 3.2 to 3.6; depth 2.5 to 2.8; D. X, 14; A. III, 15; scales 88 to 91.

Body elongate, compressed; the ventral outline anteriorly more strongly convex than the dorsal; head rather deep; snout short, 3.45 to 3.6 in head; eye very large, 2.15 to 2.25; mouth moderate, strongly oblique; the lower jaw notably projecting; maxillary scarcely reaching anterior margin of pupil, 1.8 in head; teeth in narrow villiform bands, present on jaws, vomer and palatines; preopercular margin finely serrate, the angle produced into a short flat spine; margin of opercle with a small notch a little above and behind tip of preopercular spine; gill-rakers slender, 22 or 23 on lower limb of first arch; scales small, ctenoid, reduced on head; dorsal fin with 10 slender graduated spines,

the soft part not much higher than the longest spines, its outer margin convex; caudal fin with straight or slightly concave margin, the upper rays longest; anal fin with 3 slender graduated spines, the soft part similar to that of the dorsal and opposite it; ventral fins very long, inserted in advance of base of pectorals, about equal to length of head; pectoral fins very short, 1.7 in head.

Color in alcohol brownish above, lower part of sides, chest and abdomen pale silvery; dorsal, caudal and anal pale with dusky punctulations, the interradial membranes darkest; soft dorsal and anal with traces of pale spots; the basal part of ventral fins white, with distal part black; pectoral fins plain translucent. This fish is mostly bright red in life.

There are 3 specimens, respectively 230, 277 and 290 mm. in length, in the present collection. These were taken by the use of dynamite on a coral reef.

Known from the tropical Atlantic, reported from the Gulf Stream as far north as Rhode Island and southward to Brazil. Our specimens are from Porto Bello.

358. Priacanthus cruentatus (Lacépède). (Plate LII.)

Labrus cruentatus Lacépède, Hist. Nat. Poiss., III, 1802, 522 (Martinique; from a drawing by Plumier).

Priacanthus cepedianus Desmarest, Prem. Déc. Ichth., 1823, 9, Pl. I (Havana).

Priacanthus carolinus Lesson, Voy. Coquille, Zoöl., II, 1830, 224 (Caroline Island).

Priacanthus cruentatus Morrison, Proc. Ac. Nat. Sci. Phila., 1889, 162; Boulenger, Cat. Fish. Brit. Mus., Ed. II, I, 1895, 352; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1238; Snodgrass & Heller, Proc. Wash. Ac. Sci., VI, 1905, 373.

Head 3.1 to 3.2; depth 2.45 to 2.55; D. X, 12 or 13; A. III, 13 or 14; scales 88 to 90.

Body elongate, compressed; the ventral profile more strongly convex than the dorsal; head deep; snout short, 3.3 to 3.5 in head; eye very large, 2 to 2.4 in head; mouth rather large, very oblique; the lower jaw strongly projecting; maxillary reaching a little beyond anterior margin of pupil, 1.8 to 1.87 in head; teeth all small, in villiform bands on jaws, vomer and palatines; preopercular margin very finely serrate, the angle developed into a spine which varies in size, very large in one

specimen, rather small in another, sometimes scarcely more prominent than in *P. arenatus;* margin of opercle with 2 indentations, one above and behind tip of preopercular spine as in *P. arenatus,* and another larger U-shaped one under tip of preopercular spine; gill-rakers slender, 16 to 18 on lower limb of first arch; scales small, ctenoid, reduced on head; dorsal fin continuous, with 10 graduated spines, the soft part only a little higher than the spines, its outer margin convex; caudal fin very slightly double concave, the upper rays longest; anal fin with 3 slender graduated spines, the soft part similar to that of the dorsal and opposite it; ventral fins moderate, inserted under base of pectorals, equal to length of eye and snout; pectoral fins very short, 1.7 to 1.75 in head.

Color in alcohol light brownish above, sides and lower parts pale silvery; one of our specimens has indications of about 6 dark bars on back; another specimen has brownish blotches on lower part of sides; fins mostly pale, all, except the pectorals, more or less punctulate; punctulations most numerous on distal parts of fins; the vertical fins with more or less distinct dark spots. Color in life mostly brilliantly red.

We have 3 specimens of this species, respectively 200, 240 and 255 mm. in length. One of our specimens was purchased in the market and the other two were taken on a coral reef by the use of dynamite.

The size of the preopercular spine, owing to variation, appears to be of little specific value, but the relative position of the ventral fins, the number of gill-rakers and the notches in the preopercular margin readily distinguish the species. These differences have been pointed out in the key to the species.

Known from both the Atlantic and Pacific oceans; recorded from the West Indies, Rio de Janeiro, and the Galapagos, Revillagigedo, and Cocos islands. Not as yet taken on the Pacific coast of Panama. Our specimens are from Colon and Porto Bello.

139. Genus **Pseudopriacanthus** Bleeker.

Pseudopriacanthus Bleeker, Versl. Ak. Amsterdam, 2 ser., III, 1869, 241 (type *Priacanthus niphonius* Cuvier & Valenciennes).

This genus differs from *Priacanthus* principally in the larger scales, 25 to 50 in lateral series, the deeper body, the depth more than half the length, and the shorter dorsal and anal; dorsal rays X, 11; anal rays III, 9 to 11.

359. Pseudopriacanthus serrula (Gilbert).

Priacanthus serrula Gilbert, Proc. U. S. Nat. Mus., 1890, 450 (Albatross Station 2797, Panama Bay).

Pseudopriacanthus serrula Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1896, 1239; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 101.

Head 2.66; depth 1.8; D. X, 11; A. III, 11; scales 36.

Body ovate; snout short, 5 in head; eye 2.3; interorbital 3.3; mouth very oblique; maxillary scarcely reaching vertical from middle of eye, half the length of head; teeth all small, in a narrow band on jaws and vomer, in a single series on palatines; preopercular and preorbital margin serrate, the spines at angle of preopercle enlarged; gill-rakers short, about half the diameter of pupil, about 16 on lower limb of first arch; scales along middle of sides conspicuously enlarged, the entire head scaly; spinous dorsal high, the longest spine 5/6 length of head, the first and last spines much shorter; anal spines similar but shorter, the first two equal and longer than the third, their length half that of the head; ventral fins long, reaching beyond origin of anal; pectoral fins short, scarcely reaching vertical from vent.

Color in spirits light olive; sides with 4 dark cross-bars wider than interspaces, the last on base of caudal peduncle; vertical fins dusky, the soft portions more or less speckled; ventrals black; pectorals pale.

This species was not seen by us and is known only from a single small specimen, 44 mm. long, dredged by the Albatross in Panama Bay.

Family LIV. Lutianidæ.

The Snappers.

Body elongate, compressed; head large, with prominent crests on skull; mouth usually large, terminal or with the lower jaw more or less projecting; teeth rather strong, present on both jaws and usually on palatines and tongue; premaxillaries moderately protractile; maxillary long, without a supplemental bone; opercles without spines; preopercle serrate or entire; gill-arches 4; gill-rakers short or long, few or rather numerous; gill-membranes free from the isthmus; pseudobranchiæ large; lateral line present; scales ctenoid, adherent, completely covering body and usually the sides of head; air bladder present; intestine short, pyloric cæca few; dorsal fins single or double, with 10 to 12 rather strong spines; anal fin with 3 spines; caudal fin emarginate to deeply

forked; ventral fins thoracic, with I, 5 rays; pectorals usually rather long, pointed. A large family of warm-shore fishes, nearly all of them being of much economic importance.

KEY TO THE GENERA.

a. Nostrils far apart, the anterior one situated in the end of a tube having its origin just behind the premaxillary; vomerine teeth few, molar. *Hoplopagrus*, p. 491.

aa. Nostrils close together, neither with a tube; vomerine teeth villiform.

b. Mouth rather large, moderately oblique; palatines with teeth; dorsal and anal each with fewer than 16 rays.

c. Pterygoid teeth wanting; dorsal spines 10 or 11.

d. Gill-rakers few and short, fewer than 12 on the lower limb of the first arch; the caudal lobes not especially produced in adult.

e. Anal fin with 7 to 9 rays; caudal fin emarginate or slightly forked. *Lutianus*, p. 493.

ee. Anal fin with 10 or 11 rays; caudal fin well forked. *Rabirubia*, p. 514.

dd. Gill-rakers long and numerous, about 20 on the lower limb of the first arch; caudal lobes much produced in adult. *Ocyurus*, p. 515.

cc. Pterygoid teeth present, at least in adult; dorsal spines about 12; gill-rakers long and slender, about 17 or 18 on the lower limb of anterior arch. *Rhomboplites*, p. 517.

bb. Mouth rather small, very oblique, the lower jaw strongly projecting; no teeth on palatines or tongue; soft dorsal and anal each with from 16 to 18 rays. *Xenichthys*, p. 518.

140. Genus **Hoplopagrus** Gill.

Hoplopagrus Gill, Proc. Ac. Nat. Sci. Phila., 1861, 78 (type *Hoplopagrus güntheri* Gill).

Body rather deep, robust; head deep; mouth moderate, the maxillary failing to reach eye; teeth in the jaws blunt; vomer with a few blunt teeth; nostrils far apart, the anterior one just behind premaxillary in the end of a barbel or tube; gill-rakers few; dorsal fin continuous; the soft parts of vertical fins scaly at base.

A single species of this genus is known.

360. Hoplopagrus güntheri Gill.

Hoplopagrus güntheri Gill, Proc. Ac. Nat. Sci. Phila., 1862, 253 (Cape San Lucas); Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXVII) Ichth. Beitr., VI, 1878, 1, Pl. I (Altata, Mexico); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1244, Pl. CXCVI, fig. 513; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 101 (Panama Bay).

Head 2.5 to 2.9; depth 2.3 to 2.4; D. X, 13 or 14; A. III, 9; scales 47 to 50.

Body rather deep, compressed; the back elevated; anterior profile evenly convex in young, slightly concave over snout in large specimens; head deep; snout moderate, 1.95 to 2.3 in head; eye 4 to 6.5; mouth moderate, slightly oblique, the upper jaw projecting; maxillary slipping under preorbital, failing to reach anterior margin of eye, 2.45 to 2.7 in head; teeth blunt, those in jaws anteriorly in bands at sides in a single series; two of the teeth at sides on front of lower jaw more or less canine-like; vomer with from 1 to 5 blunt teeth; preopercular margin deeply notched, serrate; gill-rakers short, 7 or 8 on lower limb of first arch; scales moderate, the series above lateral line parallel with it, 6 rows between the lateral line and origin of dorsal; soft parts of vertical fins with scales or interradial membranes at base only; pectoral fins with a patch of scales at base, paired fins otherwise naked; dorsal fin long, the spines strong, the fourth usually the longest, scarcely as long as snout, the soft part pointed, the median rays produced; caudal fin only slightly emarginate; anal fin with 3 strong spines, the second and third of about equal length, notably shorter than the longest dorsal spine, the soft portion similar to that of the dorsal; ventral fins moderate, inserted notably nearer origin of anal than tip of lower jaw; pectoral fins rather long, falcate, 1.1 to 1.2 in head.

Color of fresh specimen, 230 mm. in length, reddish, with pale cross-bars on sides; a dark blotch at base of last rays of dorsal; iris red; pectorals and dorsal reddish yellow, other fins dark red. The pale cross-bars disappear in the adult and the color becomes more nearly uniform dark brown in spirits (reddish in life).

The present species is represented by 6 specimens, ranging in length from 230 to 515 mm. It is not abundant on the coast of Panama and it is rarely seen in the market.

Known from Guaymas to Panama. Our specimens are from Balboa and Panama City.

141. Genus **Lutianus** Bloch.

Lutianus Bloch, Naturg. Ausl. Fische, IV, 1790, 107 (type *Lutianus lutianus* Bloch).

Mesoprion Cuvier & Valenciennes, Hist. Nat. Poiss., 11, 1828, 441 (type *Lutianus lutianus* Bloch; name substituted for *Lutianus*, regarded as objectionable).

Neomænis Girard, Proc. Ac. Nat. Sci. Phila., 1858, 167 (type *Lobotes emarginatus* Baird & Girard = *Labrus griseus* Linnæus).

Raizero Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 438 (type *Mesoprion aratus* Günther).

Body elongate, compressed; the back more or less elevated; head long; snout more or less pointed; nostrils usually close together, neither with a tube; mouth large; each jaw with a band of teeth, the outer ones usually enlarged, upper jaw with 2 to 4 canines anteriorly; villiform teeth present on vomer, palatines and tongue; preopercular margin serrate, with or without a shallow notch above its lower posterior angle; gill-rakers rather few, usually present only on lower limb of arch; scales moderate, ctenoid, wanting on head or present only at nape; soft dorsal and anal rays scaly at base; dorsal spines 10 or 11, not separated from the soft rays; caudal fin emarginate or slightly forked; anal rays 7 to 9.

KEY TO THE SPECIES.

a. Vomerine patch of teeth either crescent- or diamond-shaped, without a median backward projection.

b. Vomerine patch of teeth diamond-shaped; dorsal fin with X, 14 rays; anal fin III, 9; scales above lateral line not throughout parallel with it, 6 or 7 rows between the lateral line and base of first dorsal spine. *jordani*, p. 495.

bb. Vomerine teeth more or less crescent-shaped, no median backward projection; anal fin with III, 8 rays.

c. Dorsal normally with XI, 13 rays; scales large, series above the lateral line throughout parallel with it, usually with 4 (rarely 5) rows between the lateral line and base of first dorsal spine; each scale on side with a pale area, forming lines along the rows of scales. *aratus*, p. 496.

cc. Dorsal normally with X, 14 rays; scales somewhat smaller, never fewer than 5 series between the lateral line and base of first dorsal spine.

d. Scales rather large, not more than 50 vertical series below lateral line; no black lateral blotch.

e. Soft part of dorsal and anal not greatly elevated, each with convex outline; series of scales above lateral line not throughout parallel with it; lateral teeth in lower jaw notably enlarged, canine-like.

f. Maxillary moderate, 2.3 to 2.4 in head; gill-rakers 7 or 8; 5 or 6 rows of scales between the lateral line and base of first dorsal spine. *novemfasciatus*, p. 497.

ff. Maxillary longer, 2.15 to 2.25 in head; gill-rakers 6; 6 or 7 rows of scales between the lateral line and base of first dorsal spine. *cyanopterus*, p. 499.

ee. Soft dorsal and anal elevated, pointed; series of scales above the lateral line parallel with it; 5 or 6 rows between the lateral line and base of first dorsal spine; lateral teeth in lower jaw not much enlarged. *colorado*, p. 500.

dd. Scales small, 55 to 60 vertical series below the lateral line; the series above lateral line very oblique; 7 or 8 rows between the lateral line and base of first dorsal spine; soft parts of dorsal and anal elevated, more or less pointed; a small jet-black lateral spot present. *analis*, p. 501.

aa. Vomerine patch of teeth more or less anchor-shaped, with a distinct median backward projection.

g. Dorsal normally with 12 rays; a black lateral spot present at all ages.

h. Gill-rakers numerous, 10 or 11 on lower limb of first arch; rows of scales on sides with dark stripes in spirits; lateral blotch very large, equal to or larger than eye. *guttatus*, p. 503.

hh. Gill-rakers fewer, 7 to 9 on lower limb of first arch; rows of scales not marked by dark stripes.

i. Mouth oblique, the lower jaw projecting; eye very large, about 3.7 in head in specimens 175 mm. in length; body chiefly red, without yellow or golden horizontal stripes; rows of scales on upper part of sides marked by narrow bronze stripes; no stripes on head; lateral blotch very large. *mahogoni*, p. 504.

ii. Mouth nearly horizontal, terminal; eye moderate, about 4.75 in head in specimens 175 mm. in length; body chiefly greenish, with 3 golden stripes on head and 9 on body; lateral blotch rather small, rarely as large as eye. *synagris*, p. 505.

gg. Dorsal normally with 14 rays; black lateral spot wanting, except in young of *L. aya*.

j. Series of scales above lateral line not throughout parallel with it; rows of scales without silvery stripes.

k. Gill-rakers rather numerous, 9 or 10 on lower limb of first arch; anal fin normally with 9 rays; color nearly uniform rose red; young with a black lateral blotch. *aya*, p. 507.

kk. Gill-rakers fewer, 7 or 8 on lower limb of first arch; anal normally with 8 rays.

l. Scales rather small, the series above the lateral line very oblique, 7 or 8 rows between the lateral line and base of first dorsal spine; a broad white bar from eye to angle of mouth. *jocu*, p. 508.

ll. Scales rather larger, the series of scales above lateral line less strongly oblique, usually fewer than 7 rows between the lateral line and base of first dorsal spine; no white bar below eye.

m. Body rather deep, 2.45 to 2.7 in length; anterior profile notably concave in adult; snout long, pointed, 2.4 to 3.25 in head; 5 or rarely 6 rows of scales between the lateral line and base of first dorsal spine; rows of scales not marked by dark lines or only faintly so; caudal fin not edged with black. *apodus*, p. 509.

mm. Body more elongate, 2.65 to 2.9 in length; anterior profile only slightly concave in adult; snout shorter and less strongly pointed, 2.55 to 3.2 in head; 6 or rarely 7 rows of scales between the lateral line and base of first dorsal spine; rows of scales on sides marked by dark lines; caudal fin edged with black. *griseus*, p. 511.

jj. Series of scales above lateral line parallel with it; 5 or 6 rows between the lateral line and base of first dorsal spine; gill-rakers in moderate numbers, 8 or 9 on lower limb of first arch; rows of scales on sides marked with more or less distinct silvery streaks. *argentiventris*, p. 513.

361. Lutianus jordani (Gilbert).

Neomænis jordani Gilbert, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1251 (Panama Bay).

Lutianus jordani Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 102, Pl. XIV, fig. 29 (Panama Bay); Snodgrass & Heller, Proc. Wash. Ac. Sci., VI, 1905, 375 (Cocos Island).

Head 2.8 to 2.95; depth 2.75; D. X, 14; A. III, 9; vertical series of scales below lateral line 45 or 46.

Body elongate; the dorsal region elevated; profile straight or slightly convex over snout and eyes; head rather short; snout short, pointed, 3 to 3.4 in head; eye 3.7 to 4.05; mouth large, terminal, oblique;

maxillary reaching to or past middle of eye, 2.2 to 2.3 in head; upper jaw anteriorly with one or two canines, lower jaw anteriorly with enlarged teeth; vomerine teeth in a diamond-shaped patch; teeth on tongue in a very broad band; preopercular margin finely serrate, with a rather prominent notch above its lower posterior angle; gill-rakers rather few, 7 on lower limb of first arch; scales moderate, the series above lateral line not throughout parallel with it, 6 or 7 rows between the lateral line and origin of the dorsal; caudal fin almost wholly covered with scales; soft parts of dorsal and anal scaly at base; dorsal fin scarcely notched, the spines strong, the fourth the longest, equal to length of snout and half the eye, the soft part rather low, with gently convex outline; caudal fin posteriorly broadly emarginate; anal fin with 3 graduated spines, the soft portion shorter but similar to that of the dorsal; ventral fins inserted a little nearer origin of anal than tip of lower jaw; pectoral fins pointed, 1.15 to 1.25 in head.

Color of preserved specimens dark brown above, lower parts paler; the bases of the scales on lower part of sides pale; no lines on head; no lateral spot; the pectorals pale, all the other fins dusky.

This species, although originally described from Panama, was not taken by us. It is here described from 2 specimens from Cocos Island, deposited in the National Museum.

Known from the Pacific coast of Costa Rica, Panama and Cocos Island.

362. Lutianus aratus (Günther).

Mesoprion aratus Günther, Proc. Zoöl. Soc. London, 1864, 145 (Panama; Chiapam, Guatemala); Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 335, 1899, 2 (Sta. Elena Bay, Ecuador).

Lutjanus aratus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 355.

Neomænis aratus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1273.

Lutianus aratus Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 103 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 112 (Perico Island, Panama Bay).

Head 2.7 to 3.1; depth 2.7 to 3.5; D. XI, 13; A. III, 8; scales 42 to 47.

Body elongate, compressed; the dorsal region little elevated; anterior profile nearly evenly convex; head rather long; snout pointed, 2.85 to 3.5 in head; eye 3.8 to 5.35; mouth moderate, slightly oblique, terminal; maxillary reaching nearly or quite opposite middle of eye, 2.25 to 2.5 in head; teeth in the jaws anteriorly in bands, posteriorly

in a single series in lower jaw, the outer series in each jaw enlarged, 2 in anterior part of upper jaw canine-like; patch of vomerine teeth crescent-shaped; palatine and tongue with bands of villiform teeth; preopercular margin serrate, slightly notched just above its lower posterior angle; gill-rakers rather long, 7 on lower limb of first arch; scales large, the series above lateral line parallel with it, those below it horizontal, 4 or 5 rows between the lateral line and origin of dorsal; caudal fin almost completely scaled in adult, with scales on base only in young; dorsal, anal and pectorals with scales on base; dorsal fin long, the spines stiff, the last 3 or 4 spines all of about equal length, the third or fourth spine the longest, equal to length of snout and about half the eye, the soft part of fin notably higher than the posterior spines, with strongly convex margin; caudal fin deeply concave, the lobes acute; anal fin with 3 graduated spines, the longest equal to length of eye, the soft portion similar to that of the dorsal, but shorter; ventral fins moderate, inserted midway between the tip of lower jaw and the origin of the anal or slightly nearer the former; pectoral fins rather long in adult, slightly falcate, 1.15 to 1.4 in head.

Color in alcohol dark brown above, pale below; each scale on sides with a pale area, forming pale lines along the rows of scales, these most distinct below lateral line; dorsal, caudal and anal dusky; ventrals pale at base, with dark tips; pectoral pale, with dark brown axil; sides in young with about 6 pale or silvery vertical stripes, disappearing when the fish reaches a length of about 170 mm.

We obtained 9 specimens, ranging in length from 125 to 447 mm. This species appears to be rather rare on the coast of Panama, and it is rarely seen in the market.

Known from Mazatlan to Ecuador. Our specimens are from Taboga Island, Chame Point, Balboa and Panama City.

363. Lutianus novemfasciatus Gill.

Lutjanus novemfasciatus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 251 (Cape San Lucas).

Mesoprion pacificus Bocourt, Ann. Sci. Nat., 5 ser., X 1868, 223 (Tauesco, Pacific coast of Guatemala).

Lutjanus prieto Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 353 (Mazatlan).

Lutjanus pacificus Vaillant & Bocourt, Miss. Sci. Méx., etc., Pt. IV, 1883, 123, Pl. III, fig. 2.

Neomænis novemfasciatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1252.

Lutianus novemfasciatus Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 102 (Panama Bay).

Head 2.4 to 2.75; depth 2.9 to 3.2; D. X, 14 (rarely 13); A. III, 8; scales in horizontal series below lateral line 43 to 48.

Body very elongate, compressed; the dorsal region not much elevated; profile nearly straight and oblique over snout and eyes; head rather low; snout moderately long, 2.8 to 3.4 in head; eye 4 to 5.7; mouth large, slightly oblique, terminal; maxillary reaching nearly or quite opposite middle of eye, 2.3 to 2.4 in head; teeth in the jaws anteriorly in bands, reduced to a single enlarged series posteriorly in lower jaw, upper jaw anteriorly with a single pair of large canines, lower jaw with from 5 to 7 canines on each side; vomerine teeth in a triangular or more or less crescent-shaped patch, no median posterior prolongation; palatines with a band of minute teeth; tongue with a large oval-shaped patch of teeth preceded by 2 or 3 smaller patches; opercular margin finely serrate, scarcely notched above its lower posterior angle; gill-rakers few, 7 or 8 on lower limb of first arch; scales rather large, series above lateral line oblique, those below it nearly or quite horizontal, 5 or 6 rows between the lateral line and origin of dorsal; caudal fin with small scales on lower half or two-thirds, base of soft parts of dorsal and anal and the base of pectorals scaly; dorsal fin long, scarcely notched, the spines rather strong, the third or fourth the longest, equal to or a little longer than snout, the soft part rather high, with strongly convex outline; caudal fin posteriorly moderately concave, not forked; anal fin with 3 graduated spines, the longest about two-thirds the length of the longest dorsal spine, the soft portion similar to that of the dorsal; ventral fins moderate, inserted notably nearer origin of anal than tip of lower jaw; pectoral fins pointed in adult, 1.35 to 1.5 in head.

Color in alcohol uniform dark brown above, silvery below; no lateral spot, and no lines along the rows of scales; dorsal and caudal dusky; anal fin mostly black, with the first and last rays paler; ventrals largely white, with dusky on distal parts; pectorals with brown axil and base, elsewhere plain translucent.

This snapper is represented in the present collection by 4 specimens, ranging in length from 91 to 390 mm. It appears to be rare on the Pacific coast of Panama. Our largest specimen was taken in a tidal stream several miles from the shores of the Bay. The species is said to reach a large size.

Known from Lower California south to the Galapagos Islands. Our specimens are from Chame Point and Corozal.

364. Lutianus cyanopterus (Cuvier & Valenciennes.).

Mesoprion cyanopterus Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 472 (Brazil).

?Mesoprion pargus Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 473 (Puerto Rico).

Lutjanus cynodon Poey, Syn. Pisc. Cub., 1868, 294.

Mesoprion cynodon Poey, Repertorio, II, 1868, 268 (not of Cuvier & Valenciennes).

Lutjanus cubera Poey, Ann. Lyc. Nat. Hist. N. Y., X, 1871, 75 (Cuba).

Lutjanus dentatus Duméril, in Vaillant & Bocourt, Miss. Sci. Méx., etc., Pt. IV, 1883, 125.

Lutjanus cyanopterus Jordan, Proc. U. S. Nat. Mus., 1886, 534.

Neomænis cyanopterus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1254.

Head 2.6 to 2.75; depth 2.8 to 3.05; D. X, 14; A. III, 8; horizontal series of scales below lateral line 48 to 50.

Body elongate; the back not much elevated; profile straight or slightly convex over snout and eyes; head rather long; snout moderate, 2.7 to 3.3. in head; eye 3.8 to 5.8; mouth large, terminal, slightly oblique; maxillary reaching to anterior margin of eye in large examples, to middle of eye in young, 2.15 to 2.25 in head; upper jaw with one or two pairs of canines, 4 or 5 strong canines on each side of lower jaw; vomerine teeth in a crescent-shaped patch, without a median backward projection; palatine teeth in prominent bands; teeth on tongue in an elongate patch, preceded by two or three smaller patches; preopercular margin finely serrate, with a broad but slight indentation above its lower posterior angle; gill-rakers few, 6 on lower limb of first arch; scales rather small, the series above lateral line not throughout parallel with it, 6 or 7 rows between the lateral line and origin of dorsal; soft parts of vertical fins scaly at base only; dorsal fin not very deeply notched, the spines rather slender, the third or fourth the longest, equal to length of snout in young, proportionately shorter in adult, the soft part not greatly elevated, its outline broadly convex; caudal fin not deeply concave, nearly straight in young; anal fin with 3 graduated spines, the soft part shorter but similar to that of the dorsal; ventral fins inserted slightly nearer origin of anal than tip of lower jaw, pectoral fins moderate, pointed in adult, 1.25 to 1.5 in head.

Color in alcohol dark grayish brown above; pale below, with brown punctulations; center of scales on lower part of sides pale, making pale streaks along the rows of scales; no dark lateral spot; no markings on

head; dorsal, caudal, anal and distal third of ventrals very dark; base of ventrals and pectoral fins pale.

Only 3 specimens, and the head of a fourth, a large specimen about 700 mm. in length, were preserved. The whole specimens at hand vary from 130 to 445 mm. in length.

This species is very closely related to *L. novemfasciatus* from the Pacific coast, from which it can scarcely be separated. From the limited number of specimens which we have for comparison, the two species appear to differ slightly in the length of the maxillary, which appears to be a little longer in the Atlantic coast form, which also seems to have one or two fewer gill-rakers on the lower limb of the first arch, and usually one more row of scales between the lateral line and origin of dorsal. The color appears to be identical.

Known from the West Indies south to Brazil. Our specimens are from Toro Point, Mindi Cut and Porto Bello.

365. Lutianus colorado Jordan & Gilbert.

Lutjanus colorado Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 338, 351, 355 (Mazatlan).

Neomænis colorado Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1267.

?Mesoprion griseus Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 2 (after Cuvier & Valenciennes; recorded from Rio Tuyra, Panama, without comment).

Lutianus colorado Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 103 (Panama Bay).

Head 2.65 to 2.9; depth 2.6 to 2.8; D. X, 14; A. III, 8; scales in horizontal series below lateral line 42 to 46.

Body elongate, compressed; the back elevated; anterior profile convex at all ages; head rather short; snout moderately blunt, 2.7 to 3.35 in head; eye 4.1 to 5.8; mouth rather large, low, terminal, nearly horizontal; maxillary reaching to or somewhat past the middle of eye, 2.25 to 2.5 in head; two or three pairs of canines in anterior part of upper jaw; the lateral teeth in lower jaw not greatly enlarged; vomerine teeth in a crescent-shaped patch, no median backward extension; palatine teeth in rather board bands; tongue with a broad patch of teeth posteriorly, preceded by one or two smaller patches; preopercular margin finely serrate, with a moderately developed indentation above lower posterior angle; gill-rakers rather few, 7 or 8 on lower limb of first arch; scales moderate, the series above lateral line parallel with it, those below lateral line horizontal, 5 or 6 rows be-

tween the lateral line and origin of dorsal; all the fins, except the ventrals, more or less scaly at base; dorsal fin scarcely notched, the spines strong, the third or fourth the longest, equal to length of snout in adult, proportionately longer in young, the median part of soft dorsal elevated, the margin acute; caudal fin concave posteriorly but not forked; anal fin with 3 strong spines, the second the longest, but failing to reach the tip of the third when deflexed, the soft portion high, with acute outline; ventral fins inserted notably nearer origin of anal than tip of lower jaw; pectorals moderate, 1.1 to 1.25 in head.

Color in life red, darker above than below; each scale on upper part of side with dark base; no blue lines on head; no lateral spot; fins largely red. Color in spirits dark brown above, chest and abdomen pale silvery, or punctulate; vertical fins mostly dusky; paired fins pale.

This species is represented by 14 specimens, ranging from 100 to 435 mm. in length. This snapper is rather rare and was not observed in the markets. Most of our specimens were taken in tide streams in very muddy and often slightly brackish water.

Known from Guyamas south to Panama. Our specimens are from Chame Point, Balboa and Corozal.

366. Lutianus analis (Cuvier & Valenciennes).

Mesoprion analis Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 452 (San Domingo).

Mesoprion sobra Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 453 (Martinique).

Mesoprion isoodon Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 443 (San Domingo).

Mesoprion rosaceus Poey, Ann. Lyc. Nat. Hist. N. Y., IX, 1870, 317 (Cuba).

Lutjanus analis Poey, Enumeratio, 1875, 29; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 132 (Colon).

Lutjanus rosaceus Poey, Enumeratio, 1875, 30.

Neomænis analis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1265, Pl. CXCVIII, fig. 517.

Head 2.65 to 2.85; depth 2.5 to 2.75; D. X, 14 (very rarely 13); A III, 8; scales in horizontal series below lateral line 55 to 60.

Body elongate, compressed; the dorsal region moderately elevated; anterior profile gently convex; head rather deep; snout long, 2.2 to 2.9 in head; eye 3.7 to 5.1; mouth moderate, terminal, slightly oblique; maxillary reaching to or a little past anterior margin of eye in young,

failing to reach eye in adult, 2.3 to 2.55 in head; teeth in jaws anteriorly in villiform bands, reduced to a single series posteriorly in lower jaw, 4 teeth in anterior part of upper jaw enlarged, canine-like; vomerine teeth more or less triangular in shape, no median backward projection; palatine teeth in narrow bands; teeth on tongue minute, wanting in young; preopercular margin sharply serrate, slightly notched above lower posterior angle; gill-rakers rather few, 7 or 8, exclusive of rudiments, on lower limb of first arch; scales rather small, the series above lateral line oblique, those below lateral line becoming more nearly horizontal, 7 or 8 rows between the lateral line and origin of dorsal; caudal fin mostly covered with scales, ventrals naked, the other fins with small scales at base only; dorsal fin long, not deeply notched, the spines stiff, the fourth the longest, equal to or a little shorter than snout, the soft part of the fin high, the median rays produced in adult, acute; caudal fin deeply concave posteriorly, but scarcely forked, both lobes acute; anal fin with 3 graduated spines, the longest one slightly exceeding diameter of eye, the soft portion similar to that of the dorsal; ventral fins rather long, inserted somewhat nearer origin of anal than tip of lower jaw; pectoral fins pointed in adult, 1.2 to 1.5 in head.

Color of a fresh specimen dull greenish brown above, yellowish green below, with a tinge of red on chest and abdomen; sides with about 6 indistinct dusky bars; a jet black spot, smaller than the eye, on the lateral line under the anterior rays of the soft dorsal; besides these there are about 6 irregular oblique blue stripes on sides; sides of head with a blue line from interorbital through eye to upper angle of gill opening, another blue line extending from upper jaw below eye where it forks, the upper branch ending at upper angle of gill-opening, the lower branch extending to posterior angle of opercle, a third blue line extending from just above angle of mouth to margin of opercle; fins all reddish; anal and ventrals brick red; caudal with black margin posteriorly. The bright colors disappear in spirits, leaving the upper part of sides grayish, and the lower party silvery; rows of scales on back usually marked by wavy dark lines; the bluish lines on sides of head usually remaining as dark lines. The dusky cross-bars are noticeable only in specimens of about 150 mm. and less in length.

More than 100 specimens, ranging from 50 to 335 mm. in length, were preserved. This species is seen in the markets daily.

Known from Massachusetts to Brazil. Our specimens are from Toro Point, Cristobal, Colon and Porto Bello.

367. Lutianus guttatus (Steindachner).

Mesoprion guttatus Steindachner, (Sitzb. k. Ak. Wiss. Wien, LX) Ichth. Notizen, IX, 1869, 18, Pl. VIII (Mazatlan); Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 335, 1899, 2 (Sta. Elena Bay, Ecuador).

Lutjanus guttatus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 354.

Neomænis guttatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1269.

Lutianus guttatus Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 103 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 112 (Perico Island, Panama Bay).

Head 2.6 to 2.95; depth 2.55 to 3; D. X, 12 (rarely 13); A. III, 8; scales 47 to 52 in horizontal series below lateral line.

Body elongate, compressed; the dorsal region moderately elevated; anterior profile slightly concave over snout and eyes in very large specimens, straight to gently convex in young; head moderate; snout pointed, 2.5 to 3.6 in head; eye 3.15 to 5.25; mouth rather large, nearly horizontal, the lower jaw slightly projecting; maxillary reaching to or slightly past anterior margin of pupil; teeth in the jaws anteriorly in narrow villiform bands, reduced to a single series posteriorly in lower jaw, 4 teeth in anterior part of upper jaw enlarged, canine-like; vomerine teeth more or less anchor-shaped, the median backward prolongation very narrow and rather short; teeth on palatines and tongue minute, in narrow bands; preopercular margin sharply serrate, notched above lower posterior angle; gill-rakers rather numerous, 10 or 11, exclusive of rudiments, on lower limb of first arch; scales moderate, the series above lateral line quite oblique, those below it becoming horizontal, 7 rows between the lateral line and origin of dorsal; caudal fin largely scaly, ventrals naked, the other fins with a few scales on base only; dorsal fin long, not perceptibly notched, the spines stiff, the fourth usually the longest, not quite as long as snout and half the eye, the soft part rather high, with strongly convex outline; caudal fin rather deeply concave posteriorly, both lobes acute; anal fin with 3 graduated spines, the longest not quite as long as snout, the soft portion similar to that of the dorsal; ventral fins moderate, inserted a little nearer origin of anal than tip of lower jaw; pectoral fins pointed, 1.1 to 1.4 in head.

Color of a fresh specimen greenish above, lower part of sides silvery with tinge of red, chest and abdomen pale yellowish; a large jet black spot present on and above lateral line below base of anterior rays of soft part of dorsal; rows of scales on upper part of sides

marked by dark greenish yellow spots above the lateral line, becoming plain yellow below it; mouth yellow inside; iris golden; dorsal and caudal reddish; anal and ventrals golden; pectorals pale. There is considerable variation among specimens, some are almost wholly bright red on sides. The distinctness of the spots on scales varies greatly and in some instances the spots are almost wholly wanting. Occasionally the soft dorsal is distinctly spotted with greenish spots, but usually these are wholly wanting. The bright colors disappear in spirits, leaving the upper parts pale grayish and the lower parts silvery; the spots on the scales become dark. No indication of crossbars in the young has been noticed, but the dark lateral spot is very large and distinct, and slightly ocellated.

This species is represented in the present collection by 40 specimens, ranging in length from 40 to 465 mm. It is the most common and most important food fish of the family on the Pacific coast of Panama.

Known from Guaymas to Ecuador. Our specimens are from Naos Island, Balboa, Corozal and the Panama City market.

368. Lutianus mahogoni (Cuvier & Valenciennes).

Mesoprion mahogoni Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 447 (Martinique).

Mesoprion ricardi Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 447 (Martinique).

Mesoprion ojanco Poey, Memorias, II, 1860, 150, Pl. XIII, fig. 10 (Cuba).

Lutjanus ojanco Poey, Enumeratio, 1875, 28.

Lutjanus mahogani Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 451.

Neomænis mahogoni Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1272.

Head 2.65 to 2.8; depth 2.6 to 2.95; D. X, 12; A. III, 8; scales in horizontal series above lateral line 57 to 63, below it 47 to 49.

Body rather strongly compressed; the back elevated; anterior profile nearly straight to slightly concave over snout and eyes; head rather large; snout long, pointed, 2.65 to 2.8 in head; eye very large, 3.7 to 4.05 in head; mouth rather large, somewhat oblique, the lower jaw slightly projecting; maxillary reaching to or slightly past anterior margin of pupil, 2.25 to 2.35 in head; teeth in the jaws in villiform bands, reduced to a single series posteriorly in lower jaw, the outer teeth slightly enlarged, usually 4 in anterior part of upper jaw canine-like; teeth on vomer more or less anchor-shaped, with the median

backward prolongation very narrow and rather short; teeth on palatines and tongue in rather narrow bands; preopercular margin serrate, notably concave above its lower posterior angle; gill-rakers rather long at angle, 8 or 9 more or less developed on lower limb of first arch; scales moderate, somewhat reduced anteriorly above lateral line, the series quite oblique, those below lateral line horizontal, 6 or 7 rows between the lateral line and origin of dorsal; caudal fin mostly covered with scales, soft parts of dorsal and anal and the pectorals with a few scales at base, otherwise naked; dorsal fin not very deeply notched, the spines rather slender, the fourth usually the longest, equal to or slightly longer than snout, the soft part moderately elevated, with strongly convex margin; caudal fin rather deeply concave posteriorly but scarcely forked, both lobes acute; anal fin with 3 graduated spines, the longest equal to or a little longer than eye, the soft portion rather high, with strongly convex margin; ventral fins moderate, inserted rather notably nearer origin of anal than tip of lower jaw; pectoral fins long, sharply pointed, 1.2 to 1.3 in head.

Color in life chiefly red; the back deep brown; belly largely silvery; a large black blotch on lateral line under anterior part of soft dorsal; rows of scales on upper part of sides marked by narrow bronze stripes; dorsal fin pale at base, edged with red; the other fins mostly deep red. The bright colors fade in alcohol, leaving the back grayish brown, the lower parts silvery and the fins pale.

This apparently rather rare species is represented in the present collection by 10 specimens, ranging in length from 230 to 300 mm. It is readily distinguished from related species by the large eye and the very large black lateral spot. We have compared our specimens with a specimen from Cuba, deposited in the National Museum, and identified by Poey as *L. ojanco,* and this fish and our specimens are certainly identical. *L. ojanco* has been referred to the synomy of *L. mahogoni.*

Known from the West Indies to Cartagena. Our specimens are from Toro Point and Porto Bello.

369. Lutianus synagris (Linnæus).

Sparus synagris Linnæus, Syst. Nat., Ed. X, 1758, 280 (Bahamas).

Sparus vermicularis Block & Schneider, Syst., Ichth., 1801, 275 (Martinique; on a drawing by Plumier).

Lutjanus aubrieti Desmarest, Prem. Déc. Ichth., 1823, 17, Pl. II, (Cuba).

Mesoprion uninotatus Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 449 (San Domingo; Martinique).

Lutjanus uninotatus Poey, Syn. Pisc. Cub., 1868, 294.

Lutjanus synagris Poey, Enumeratio, 1875, 27; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 132 (Colon).

Neomænis synagris Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1270, Pl. CXCVIII, fig. 518.

Head 2.6 to 2.75; depth 2.45 to 2.7; D. X, 12; A. III, 8; scales in horizontal series below lateral line 46 to 53.

Body elongate, compressed; the dorsal region elevated; anterior profile rather steep, nearly straight over snout and eyes, strongly convex at nape; head moderate; snout pointed, 2.7 to 3.45 in head; eye 3.2 to 4.75; mouth rather large, terminal, horizontal; maxillary reaching nearly or quite opposite middle of eye, 2.25 to 2.4 in head; teeth in the jaws anteriorly in villiform bands, reduced to a single series posteriorly in lower jaw, 4 of the teeth in anterior part of upper jaw enlarged, canine-like; vomerine teeth in an anchor-shaped patch, with the median posterior prolongation rather short and narrow; teeth on palatines and tongue in narrow bands; preopercular margin sharply serrate, scarcely notched above lower posterior angle; gill-rakers rather few, 8, exclusive of rudiments, on lower limb of first arch; scales moderate, the series above lateral line slightly oblique and not parallel with it, those below lateral line horizontal, 7 rows between the lateral line and origin of dorsal; dorsal fin continuous, scarcely notched, the spines stiff, the third or fourth the longest, equal to snout and about one-third the length of eye, the soft part short, the median rays the longest, making its outline very strongly convex to nearly acute; caudal fin deeply concave posteriorly, both lobes acute; anal fin with 3 graduated spines, the longest a little longer than diameter of eye, the soft portion similar to that of the dorsal but less strongly convex; ventral fins rather long, inserted a little nearer origin of anal than tip of lower jaw; pectoral fins pointed, 1.2 to 1.45 in head.

Color of fresh specimen greenish above, lower parts silvery; sides with about 9 horizontal golden bands, 3 on sides of head; a large jet black spot present on and above lateral line under the anterior part of soft dorsal; dorsal and caudal reddish, the latter with black margin; anal and ventrals largely golden; pectorals pale pink. The young have dusky vertical bars, and are very similar to the young of *L. analis*. Color in spirits dusky gray above, silvery below; the golden

stripes on sides fade and appear as pale stripes; the fins are all plain translucent.

This species is very common and numerous specimens, ranging in length from 30 to 218 mm., were preserved. It is the smallest of the snappers, but it is seen in the markets daily and is extensively used as food. It enters shallow water and is readily taken with nets.

Known from Florida south to Brazil. Our specimens are from Toro Point, Mindi Cut, Mindi Reef, Colon and Porto Bello.

370. Lutianus aya (Bloch).

Bodianus aya Bloch, Naturg. Ausl. Fische, IV, 1790, 45, Pl. CCXXVII (Brazil).

Bodianus ruber Bloch & Schneider, Syst. Ichth., 1801, 330 (Brazil).

Mesoprion campechanus Poey, Memorias, II, 1860, 149 (Campeche).

Lutjanus campechianus Poey, Syn. Pisc. Cub., 1868, 294.

Lutjanus aya Goode, Bull. U. S. Nat. Mus., V, 1876, 55.

Lutjanus blackfordii Goode & Bean, Proc. U. S. Nat. Mus., 1878, 176 (Pensacola, Fla.).

Lutjanus vivanus Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 453.

Neomænis aya Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1264, Pl. CXCVII, fig. 516.

Head 2.65 to 3; depth 2.5 to 2.6; D. X, 14; A. III, 9; horizontal series of scales below lateral line 45.

Body elongate; the back elevated; anterior profile rather steep, nearly straight to nape; head deep; snout pointed, 2.7 to 2.8 in head; eye 3.75 to 4; mouth moderate, terminal, slightly oblique; maxillary reaching nearly or quite to anterior margin of pupil, 2.45 to 2.5 in head; upper jaw anteriorly with 3 or 4 pairs of rather small canines, the outer teeth in lower jaw somewhat enlarged; vomerine teeth in an anchor-shaped patch, with the median backward prolongation rather short; palatine teeth in rather broad bands; teeth on tongue in an elongate patch, preceded by a triangular patch; preopercular margin serrate, no evident notch above its lower posterior angle; gill-rakers rather numerous, 9 or 10 on lower limb of first arch; scales moderate, the series above lateral line not throughout parallel with it, 7 or 8 rows between the lateral line and origin of dorsal; the vertical fins scaly at base; dorsal fin not notched, the spines rather slender, the fourth spine the longest, equal to or slightly longer than the snout, the soft part with strongly convex or nearly acute outline; caudal fin rather deeply emarginate, the upper rays notably the longest; anal fin with 3 graduated spines, the soft portion of fin with angulate margin; ventral fins inserted some-

what nearer origin of anal than tip of lower jaw; pectoral fins rather long, pointed, 1.15 to 1.3 in head.

"Color in life, deep rose-red, paler on throat; bluish streaks along rows of scales, above becoming fainter and disappearing with age; fins brick-red; dorsal bordered with orange, with a narrow blackish edge; caudal narrowly edged with blackish; eye red; a large blackish blotch above lateral line and below front rays of soft dorsal in young specimens, this spot disappearing with age; axil of pectoral dusky" (Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, p. 1265).

This species, although recorded from the Atlantic coast from localities both north and south of Panama, was not taken there by us. Here described from specimens from Long Island and Florida, ranging in length from 110 to 235 mm. This is the most valuable food fish of this genus on the coast of the United States.

Recorded from Massachusetts south to Rio de Janeiro, Brazil.

371. Lutianus jocu (Bloch & Schneider).

Anthias jocu Bloch & Schneider, Syst. Ichth., 1801, 310 (Cuba).
Mesoprion jocu Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828 466.
Mesoprion litura Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828 467 (Cayenne; St. Thomas).
Lutjanus jocu Poey, Syn. Pisc. Cub., 1868, 292.
Neomænis jocu Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1257.

Head 2.6 to 2.75; depth 2.35 to 2.7; D. X, 14 (rarely 15); A. III, 8; horizontal series of scales below lateral line 42 to 46.

Body elongate compressed; the back elevated; profile nearly straight over snout and eyes in young, concave in adult; head deep; snout long, pointed, 2.25 to 2.85 in head; eye 3.45 to 4.8; mouth rather large, terminal, nearly horizontal; maxillary not quite reaching eye in adult, to anterior margin of pupil in young, 2.45 to 2.7 in head; one, rarely two, pairs of canines in anterior part of upper jaw, the lateral teeth in lower jaw not much enlarged; vomerine teeth in an anchor-shaped patch, the median backward prolongation well developed; palatine teeth in narrow bands; teeth on tongue in a single elongate patch; preopercular margin finely serrate, with only a slight indentation above lower posterior angle; gill-rakers rather few, 7 or 8 on lower limb of first arch; scales moderate, the series above very oblique, directed strongly upward and backward, those below lateral line horizontal, 7 or 8 rows between the lateral line and origin of dorsal; dorsal fin

scarcely notched, the spines strong, the fourth usually the longest, equal to length of snout, the soft part not very high, its margin broadly convex; caudal fin deeply emarginate, the upper rays the longest; anal fin with 3 strong spines, the second usually slightly the longest, reaching nearly or quite to tip of third when deflexed, the soft portion shorter but similar to that of the dorsal; ventral fins inserted notably nearer origin of anal than tip of lower jaw; pectorals moderate, pointed, 1.15 to 1.6 in head.

Color of fresh specimen dark brown above, reddish below; bases of scales rusty on upper part of side, becoming red on lower part of side, forming more or less distinct lines along the rows of scales; sides of head with a blue stripe below eye, usually broken up into elongate spots in adult; a broad whitish bar from eye to angle of mouth, very indistinct or wanting in young; fins all red, the dorsal and caudal darker red than the others. Color in alcohol brown or grayish brown above, pale below; dorsal and caudal dusky, the other fins mostly pale. There is considerable variation among specimens, some of them being much darker than others. The dark colored specimens have the dark lines along the rows of scales on upper part of body much more distinct.

This species is represented by 73 specimens, ranging in length from 50 to 305 mm. It was taken along with *L. griseus* and *L. apodus* but is somewhat less abundant. It may be distinguished from both *L. griseus* and *L. apodus* by the more numerous and much more oblique rows of scales between the lateral line and the origin of the dorsal, and by the presence of the broad white bar below eye.

Known from Massachusetts south to Bahia, Brazil. Our specimens are from Toro Point, Mindi Cut, Colon and Porto Bello.

372. Lutianus apodus (Walbaum).

?Perca apoda ("Forster, Catal. of Anim., MS., 21," 1774; printed 1844) Walbaum, Artedi Piscium, Pt. III, 1792, 351 (based on Catesby, Hist. Carolina, etc., 1743, Pl. XLI).

Sparus caxis Bloch & Schneider, Syst. Ichth., 1801, 284 (Havana).

Bodianus striatus Bloch & Schneider, Syst. Ichth., 1801, 335, Pl. LXV (West Indies; misprinted *albostriatus*, p. 237; called *B. fasciatus* on plate).

Lutjanus acutirostris Desmarest, Prem. Déc. Ichth., 1823, 12, Pl. III (Cuba).

Mesoprion cynodon Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 465 (Martinique; San Domingo).

Mesoprion linea Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 468 (Cuba; San Domingo).

Mesoprion flavescens Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 472 (Martinique).

Mesoprion caxis Poey, Repertorio, II, 1868, 269.

Lutjanus caxis Poey, Syn. Pisc. Cub., 1868, 293.

Neomænis apodus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1258, Pl. CXCVII, fig. 515.

Lutianus apodus Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 402 (Toro Point; Colon).

Head 2.5 to 2.65; depth 2.45 to 2.7; D. X. 14; A. III, 8; horizontal series of scales below lateral line 37 to 41.

Body elongate, compressed; the back elevated; anterior profile straight over snout in young, distinctly concave in adult; head moderate; snout long, sharply pointed, 2.4 to 3.25 in head; eye 3.45 to 4.25; mouth moderate, terminal, slightly oblique; maxillary reaching to or more usually a little past anterior margin of eye, 2.25 to 2.6 in head; upper jaw anteriorly with one or two pairs of canines, lateral teeth in lower jaw enlarged; vomerine teeth anchor-shaped, the median backward prolongation long; palatine teeth in bands; teeth on tongue in a single elongate patch; preopercular margin finely serrate, with a slight indentation above lower posterior angle; gill-rakers few, 7 or 8 on lower limb of first arch; scales large, the series above lateral line for the most part parallel with it, occasionally becoming slightly oblique under soft part of dorsal, the series below lateral line horizontal or slightly oblique, 5 or rarely 6 rows of scales between the lateral line and origin of dorsal; the vertical fins well scaled at base; dorsal fin scarcely notched, the spines strong, the fourth spine usually the longest, equal to length of snout in adult, proportionately longer in young, the soft part not greatly elevated, with broadly convex margin; caudal fin deeply emarginate, the upper rays the longest; anal fin with 3 strong spines, the second and third of about equal length, the second however failing to reach the tip of third when deflexed, the soft portion shorter but similar to that of the dorsal; ventral fins inserted notably nearer origin of anal than tip of lower jaw; pectoral fins rather short, 1.25 to 1.5 in head.

Color in life greenish above, pale below; the rows of scales on upper part of side faintly, or not at all, marked by dark lines; no lateral spot; young with about 8 pale vertical bars and a blue stripe on head below eye, these becoming faint or disappearing with age; soft parts of dorsal and anal greenish yellow at base, distal parts pale green; caudal fin pale

yellowish green; ventrals orange; pectorals pale yellowish. The bright colors disappear in spirits, leaving the upper part of body greenish brown, and the lower parts pale silvery; the fins are pale or slightly dusky.

More than 100 specimens of this species, ranging in length from 45 to 300 mm., were preserved. This snapper is a very common commercial species on the Atlantic coast of Panama, frequenting shallow water, apparently without regard to the nature of the bottom or the condition of the water. Some of our specimens were taken on muddy bottom, some on sandy bottom and others on coral reefs. This species is closely related to *L. griseus*. Due to much individual variation, the two at times can scarcely be separated. The following rather slight differences have been noted: The average depth of body in *L. apodus* is slightly greater, the anterior profile is more strongly concave in adult, the snout longer and more strongly pointed (not evident in young), the rows of scales above the lateral line are more nearly parallel with it, and the scales are slightly larger, there being usually one fewer row between the lateral line and origin of dorsal and 2 or 3 fewer in the lateral series. *L. apodus* is usually lighter in color, has no dark lines, or at least less distinct dark lines, along the rows of scales, the young have much more distinct light cross-bars, and the margin of the caudal fin in never black.

Known from Massachusetts south to Bahia, Brazil. Our specimens are from Toro Point, Mindi Cut, Colon and Porto Bello.

373. Lutianus griseus (Linnæus).

Labrus griseus Linnæus, Syst. Nat., Ed. X, 1758, 283 (Bahamas).

Sparus tetracanthus Bloch, Naturg. Ausl. Fische, V, 1791, 116, Pl. CCLXXIX (Antilles; on a drawing by Plumier).

Anthias caballerote Bloch & Schneider, Syst. Ichth., 1801, 310 (Cuba).

Bodianus vivanet Lacépède, Hist. Nat. Poiss., IV, 1803, 293, Pl. IV, fig. 3 (Martinique; on a drawing by Plumier).

Mesoprion griseus Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 469 (San Domingo; not after Linnæus).

Lobotes emarginatus Baird & Girard, in Baird, 9th Rept. Smith Inst., 1854 (1855), 332 (Beesley's Pt., New Jersey).

Mesoprion caballerote Poey, Repertorio, II, 1868, 157.

Lutjanus caballerote Poey, Syn. Pisc. Cub., 1868, 293.

Lutjanus griseus Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 439.

Neomænis griseus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1255.

Head 2.6 to 2.9; depth 2.65 to 2.9; D. X, 14 (rarely 13); A. III, 8; scales in horizontal series below lateral line 39 to 45.

Body elongate, compressed; the back not strongly elevated; anterior profile straight or slightly concave over snout; head moderate; snout rather pointed, 2.55 to 3.2 in head; eye 3.45 to 5.2; mouth large, terminal, slightly oblique; maxillary reaching nearly or quite to anterior margin of pupil, 2.35 to 2.55 in head; upper jaw with one or two pairs of canines, the lateral teeth in lower jaw enlarged; vomerine teeth in an anchor-shaped patch, the median backward prolongation quite long; palatine teeth in long bands; tongue with a single elongate patch or band of teeth; preopercular margin finely serrate, with a slight indentation above its lower posterior angle; gill-rakers rather few, 7 or 8 on lower limb of first arch; scales moderate, the series above lateral line not parallel with it, usually directed strongly upward under anterior part of soft dorsal, the series below lateral line usually more or less oblique and occasionally wavy, 6 or rarely 7 rows between the lateral line and origin of dorsal; vertical fins well scaled at base; dorsal fin scarcely notched, the spines strong, the fourth usually the longest, equal to snout and from one-third to one-half of eye, the soft part moderately elevated, the margin strongly convex; caudal fin emarginate, the upper rays the longest; anal fin with 3 strong spines, the second and third of about equal length, the second, however, failing to reach the tip of third when deflexed, the soft portion with strongly convex outline; ventral fins inserted notably nearer origin of anal than tip of lower jaw; pectoral fins rather short, 1.35 to 1.5 in head.

Color of fresh specimen, 275 mm. in length, dark green above, lower part of side bluish green, chest and abdomen pale red; scales on sides with rusty centers, forming lines along the rows of scales; a greenish stripe on side of head below eye (completely disappearing in alcohol); fins all reddish, the vertical fin darkest. A smaller specimen, 100 mm. in length, darker, with less red on back and sides, but more on belly; sides with about 6 faint pale bars. Color in alcohol dark brown above and on sides, chest and abdomen pale; rows of scales on sides marked by more or less distinct dark stripes, usually most distinct in young; the vertical fins dusky, the margin of dorsal and caudal black, the dorsal fin usually spotted in young; paired fins pale.

About 80 specimens of this common species, ranging from 50 to 335 mm. in length, were preserved. It enters shallow, muddy and even brackish water.

Known from Massachusetts to Brazil. Our specimens were taken at Toro Point, New Gatun, Mindi Cut, Colon and Porto Bello.

374. Lutianus argentiventris (Peters).

Mesoprion argentiventris Peters, Monatsb. k. Ak. Wiss. Berlin, 1869 704 (Mazatlan); Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 2 (Panama Bay).

Lutjanus argentiventris Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 434.

Neomænis argentiventris Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1260.

Lutianus argentiventris Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 103 (Panama Bay); Starks, Proc. U. S. Nat. Mus., XXX, 1906, 788 (Guayaquil, Ecuador); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 112 (Acapulco; Toboguilla Island, Panama Bay).

Head 2.4 to 2.8; depth 2.5 to 2.7; D. X, 14; A. III, 8 (rarely 9); scales in horizontal series below lateral line 38 to 42.

Body elongate, rather strongly compressed; the dorsal region elevated; anterior profile concave over snout in large specimens, nearly straight to slightly convex in young; head rather long; snout pointed, notably so in adult, 2.5 to 3.25 in head; eye 3.45 to 4.75 in head; mouth low, terminal, slightly oblique; maxillary reaching nearly or quite to anterior margin of pupil, 2.4 to 2.85 in head; upper jaw anteriorly with 2 or 3 pairs of canines; lateral teeth in lower jaw enlarged, but not as big as the canines in upper jaw; vomerine teeth in an anchor-shaped patch, with a long median backward prolongation; teeth on palatines and tongue in long bands; preopercular margin finely serrate, with a slight indentation above its lower posterior angle; gill-rakers moderate, 8 or 9 on lower limb of first arch; scales moderate, the series above lateral line parallel with it, those below lateral line horizontal, 5 or 6 rows between the lateral line and origin of dorsal; caudal fin mostly covered with small scales; soft parts of the dorsal and anal and the pectorals with scales on base only; ventrals wholly naked; dorsal fin somewhat notched, the spines strong, the third or fourth the longest, equal to length of snout in adult, proportionately longer in young, the soft part with strongly convex margin; caudal fin rather deeply concave posteriorly, but not forked; anal fin with 3 strong spines, the second the longest, but rarely reaching the tip of the third when deflexed, not much shorter than the longest dorsal spine, the soft portion rather high, with strongly convex outline; ventral fins inserted notably nearer origin of anal than tip of lower jaw; pectorals moderate, 1.15 to 1.4 in head.

Color in alcohol rather variable, from light gray to rather dark brown above, chest and abdomen silvery; rows of scales in some speci-

mens with pale or silvery streaks, faint or wanting in others; sides of head with a brown stripe (blue in life) just underneath the eye, this stripe sometimes broken up into spots, or rarely wanting; vertical fins more or less dusky, the paired fins pale. The body is reddish yellow in life, the vertical fins are largely red and the paired fins yellow.

We preserved about 40 specimens of this species, varying in length from 60 to 345 mm. Some of our specimens were taken on rocky bottom, some along a sandy shore, and others in very muddy tide streams. Next to *L. guttatus,* this is the most common snapper on the Pacific coast of Panama.

Known from Lower California south to Ecuador. Our specimens are from Taboga Island, Chame Point, Balboa, Corozal and the Panama City market.

142. Genus **Rabirubia** Jordan & Fesler.

Rabirubia Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 438 (type *Mesoprion inermis* Peters).

Body elongate, the dorsal region little elevated; gill-rakers few and short, about 9 on lower limb of first arch; anal fin long and low, with about 10 or 11 rays; the caudal lobes not especially produced. A single species of this genus is known.

375. **Rabirubia inermis** (Peters).

Mesoprion inermis Peters, Monastb. k. Ak. Wiss. Berlin, 1869, 705 (Mazatlan).

Lutjanus inermis Jordan, Proc. Ac. Nat. Sci. Phila., 1883, 285.

Rabirubia inermis Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 438; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1274, Pl. CXCIX, fig. 519; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 103 (Panama Bay).

Head 2.9 to 2.95; depth 3.45 to 3.7; D. X, 12 or 13; A. III, 10 or 11; scales 52 to 55.

Body elongate, compressed; the back scarcely elevated; head rather long; snout tapering, 2.9 to 2.95 in head; eye 4.3 to 4.35; mouth moderate, oblique, the lower jaw slightly projecting; maxillary to or slightly past anterior margin of eye, 2.5 to 2.55 in head; teeth pointed, 4 in anterior part of upper jaw enlarged, about 4 on each side in lower jaw somewhat enlarged; minute teeth present on vomer, palatines and tongue; preopercular margin with an entire membranous border; gill-rakers long, 9 on lower limb of first arch; scales rather small, the series above lateral line very oblique, those below lateral line horizontal, about

7 rows between the lateral line and origin of dorsal; dorsal fin continuous, scarcely notched, the spines slender, the third the longest, about as long as snout and half the eyes; the soft part very low, all the rays of about equal length; caudal fin rather deeply forked, both lobes acute; anal fin with 3 graduated spines, the longest about half the length of the longest dorsal spine, the soft portion a little higher than that of the dorsal; ventrals rather small, inserted somewhat nearer origin of anal than tip of lower jaw; pectoral fins short, 1.67 in head.

Color in alcohol brownish above, silvery below; each scale with a pearly gray spot, forming light stripes along the rows, these spots small above lateral line, becoming large on lower part of sides and gradually occupying the whole scale; dorsal and caudal dusky, the other fins mostly plain translucent; axil of pectoral dark brown.

Only 2 specimens, respectively 225 and 228 mm. in length, were secured. This species appears to be very rare on the coast of Panama. Only 4 specimens have to date been taken there by collectors.

Known from Mazatlan to Panama. Our specimens were purchased in the Panama City market.

143. Genus **Ocyurus** Gill.

Ocyurus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 236 (type *Sparus chrysurus* Bloch).

Body elongate, with long slender tail; the dorsal region somewhat elevated; pterygoid teeth present in adult; gill-rakers rather numerous, long and slender, about 20 on lower limb of first arch; anal fin rather short, with about 9 rays; caudal fin deeply forked, the lobes much produced in adults. A single species is known.

376. Ocyurus chrysurus (Bloch).

Sparus chrysurus Bloch, Naturg. Ausl. Fische, V, 1791, 28, 1790, Pl. CCLXII (Brazil).

Anthias rabirubia Bloch & Schneider, Syst. Ichth., 1801, 309 (Cuba).

Sparus semiluna Lacépède, Hist. Nat. Poiss., IV, 1803, 141, Pl. III, fig. 1 (Martinique; based on a copy of a drawing by Plumier).

Mesoprion chrysurus Cuvier & Valenciennes, Hist. Nat. Poiss., II, 1828, 459.

Mesoprion aurovittatus Agassiz, in Spix, Pisc. Brasil., 1831, 121, Pl. LXVI (Brazil).

Ocyurus chrysurus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 236; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1275, Pl. CXCIX, fig. 520; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 132 (Colon).

Ocyurus aurovittatus Poey, Syn. Pisc. Cub., 1868, 295.

Ocyurus rijgersmæi Cope, Trans. Am. Philo. Soc. Phila., XIV, 1871, 468, fig. 4 (St. Kitts).

Lutjanus chrysurus Vaillant & Bocourt, Miss. Sci. Méx., etc., Pt. IV, 1883, 133, Pl. V.

Lutjanus melanurus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 548.

Head 2.9 to 3.1; depth 2.8 to 2.97; D. X, 13 or 14; A. III, 9; scales in longitudinal series below lateral line 47 to 57.

Body elongate, compressed; the back somewhat elevated; head rather strongly compressed; snout tapering, 2.6 to 2.9 in head; eye 3.65 to 4.5; mouth moderate, oblique, the lower jaw slightly projecting; maxillary reaching to or slightly past anterior margin of eye, 2.26 to 2.55 in head; teeth pointed, about 4 in anterior part of upper jaw enlarged, canine-like; small teeth present on vomer, palatines and tongue; preopercular margin finely serrate; gill-rakers long, 19 to 21 on lower limb of first arch; scales smaller above lateral line than below it, the series above oblique, those below horizontal, 7 rows between the lateral line and origin of dorsal; caudal fin scaly, the other fins naked or with a few scales at base; dorsal fin continuous, not notched, the fourth spine the longest, a little longer than snout, the soft part low, with strongly convex margin; caudal fin deeply forked, the lobes produced in adult, sharply pointed, notably longer than head; anal with 3 graduated spines, the longest one equal to length of eye, the soft portion similar to that of the dorsal, but shorter; ventral fins rather small, inserted notably nearer origin of anal than tip of lower jaw; pectoral fins long in adult, 1.05 to 1.15 in head.

Color brownish above, pale silvery below; faint pale stripes along the rows of scales on lower part of sides; in life with a bright bronze stripe from snout through eye to caudal peduncle where it becomes indistinct; caudal peduncle and caudal fin golden yellow in life; dorsal fin yellow with more or less dusky; the other fins mostly yellow; axil of pectoral dusky.

We preserved 30 specimens, ranging in length from 40 to 260 mm. This species is fairly common on the Atlantic coast of Panama where it is of some importance as a food fish. Its flesh is of excellent quality.

Known from Florida to Brazil. Our specimens are from Toro Point, Colon and Porto Bello.

144. Genus **Rhomboplites** Gill.

Rhomboplites Gill, Proc. Ac. Nat. Sci. Phila., 1862, 236 (type *Centropristes aurorubens* Cuvier & Valenciennes).

Body elongate, compressed; mouth moderate, very oblique; villiform teeth present in large patches or well formed bands on vomer, palatines, pterygoids and tongue; gill-rakers long and slender, about 17 or 18 on lower limb of first arch; caudal fin forked, the lobes not especially produced; color red. A single species is known.

377. **Rhomboplites aurorubens** (Cuvier & Valenciennes).

Centropristes aurorubens Cuvier & Valenciennes, Hist. Nat. Poiss., III, 1829, 45 (Brazil; Martinique; San Domingo).

Mesoprion aurorubens Günther, Cat. Fish. Brit. Mus., I, 1859, 207.

Mesoprion elegans Poey, Memorias, II, 1860, 153 (Cuba).

Rhomboplites aurorubens Gill, Proc. Ac. Nat. Sci. Phila., 1862, 236; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1277, Pl. CC, fig. 521; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 402 (Colon), and 1917, 132 (Colon).

Rhomboplites elegans Poey, Repertorio, II, 1868, 158.

Lutjanus aurorubens Vaillant & Bocourt, Miss. Sci. Méx., etc., Pt. IV, 1878, 117.

Aprion ariommus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1883, 142 (Pensacola; young with pterygoid teeth undeveloped).

Head 2.9 to 3.1; depth 2.8 to 3.15; D. XII, 11; A. III, 8 or 9; scales 60 to 68.

Body elongate, compressed; the dorsal and ventral outlines about evenly curved; head moderate; snout rather blunt, 3.45 to 4 in head; eye large, 2.7 to 3.35; mouth moderate, very oblique, the lower jaw projecting; maxillary reaching slightly beyond anterior margin of eye, 2.45 to 2.6 in head; teeth in the jaws in villiform bands anteriorly, posteriorly in a single series in lower jaw, the outer teeth somewhat enlarged, but none of them canine-like; vomer, palatines, pterygoids and tongue with broad bands of patches of minute teeth; preopercular margin serrate; gill-rakers rather long, 16 to 19 on lower limb of first arch; scales rather small, the series above lateral line quite oblique, those below it less so, but not horizontal, 6 rows between the lateral line and origin of dorsal; caudal fin covered with minute scales, the other fins with a few scales at base or wholly naked; dorsal fin long, continuous, not notched, the spines rather slender, the third usually the longest, equal

to snout and about half the eye, the soft part short and low; caudal fin moderately forked, both lobes acute; anal fin with 3 rather strong graduated spines, the longest about equal to length of eye, the soft portion similar to that of the dorsal; ventral fins moderate, inserted slightly nearer origin of anal than tip of lower jaw; pectoral fins rather long, the upper rays somewhat produced, 1.1 to 1.25 in head.

Color in life vermillion, paler below, fading to almost a straw color in spirits; faint narrow brown streaks along the rows of scales on upper part of sides; fins all pale in spirits, red to yellowish in life.

Of this species 16 specimens were preserved, ranging in length from 185 to 235 mm. It was seen on only two occasions and then in rather large numbers. It enters the shallow water of Fox Bay at Colon. A female taken in January has the ovaries somewhat distended with rather small eggs. The intestinal canal is very short, and the pyloric cæca few, but large.

Known from North Carolina to southern Brazil. Our specimens are all from Colon.

145. Genus **Xenichthys** Gill.

Xenichthys Gill, Proc. Ac. Nat. Sci. Phila., 1863, 82 (type *Xenichthys xanti* Gill).

Body elongate, not greatly compressed; head moderate; snout short, conical; eyes large; mouth rather small, very oblique; lower jaw strongly projecting; teeth minute, in narrow bands in jaws, none of them enlarged, a small patch on vomer, none on palatines and tongue; preopercular margin entire; gill-rakers long and slender; scales small, ctenoid; dorsal fins separate, the spines very slender, 12 in number, the soft dorsal very low, with about 17 rays; caudal fin emarginate; anal fin with 3 rather slender graduated spines, the soft part similar to that of the dorsal.

378. **Xenichthys xanti** Gill.

Xenichthys xanti Gill, Proc. Ac. Nat. Sci. Phila., 1863, 82 (Cape San Lucas; young); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1287; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 103 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 113 (Perico Island, Panama Bay); Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 410 (Panama).

Xenichthys xenops Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 325 (Panama; adult).

Head 2.5 to 3.15; depth 2.8 to 3.05; D. XI-I, 17 or 18; A. III, 16 to 18; scales 54 to 62.

Body elongate, compressed; the back little elevated; head moderate; snout pointed, short, 3.8 to 4.5 in head; eye very large, 2.55 to 3; mouth moderate, strongly oblique, the mandible strongly projecting; maxillary reaching nearly or quite to anterior margin of pupil, 2.5 to 3 in head; teeth very small, pointed, in narrow bands in jaws, none of them enlarged, a band of minute teeth on vomer, none on palatines or tongue; preopercle entire; gill-rakers long and slender, 15 to 17 on lower limb of first arch; scales small, 10 to 12 rows between the lateral line and origin of dorsal; the soft parts of the dorsal and anal densely scaled, the other fins also largely scaled; dorsal fins distinctly separate, the spines weak, the third or fourth the longest, nearly equal to length of snout and eye; soft dorsal low, with nearly straight margin; caudal fin with broadly concave margin, the upper lobe acute; anal spines weak, the third the longest, not more than half the length of the longest dorsal spine, the soft portion similar to that of the dorsal; ventral fins moderate, inserted somewhat nearer origin of anal than tip of lower jaw; pectoral fins rather short, 1.36 to 1.6 in head.

Color of a fresh specimen greenish brown above, sides silvery with golden reflections, lower parts pale; faint dark horizontal stripes present on upper part of sides; a dark blotch at shoulder; pectoral fins yellowish, the other fins dark or dusky; the anal fin distally yellowish green. In some of our specimens the dark stripes on upper part of sides are wanting, these are usually most distinct in the smaller specimens. Caudal spot varied, large and distinct, small and ill defined or even wanting.

We preserved 39 specimens, ranging in length from 135 to 200 mm. This species, although its flesh is rather soft, is a common food fish on the Pacific coast of Panama where it is brough to the market in large numbers. A female taken in February has the ovaries well distended with eggs. A comparison of specimens of this species with specimens of *X. agassizi* Steindachner from the Galapagos Islands, verifies the statement of Gilbert & Starks that the last named species differs from the former in the smaller scales (73 in series just above lateral line), smaller eye, which is most evident when specimens of like size are compared, and in the notably longer pectoral fins (about 1.1 in head).

This species is known from Cape San Lucas to Panama. Our specimens are from Balboa and the Panama City market.

Family LV. Hæmulidae.

The Grunters.

Body more or less elongate, compressed; the back usually elevated; head large; snout blunt or pointed; mouth large or small, usually terminal, low and more or less horizontal; premaxillaries protractile; maxillary without supplemental bone, slipping partly under preorbital; no suborbital stay; no barbels; teeth pointed or conical, no canines, none on vomer, palatines or tongue; lower pharyngeals separate, with pointed teeth; preopercle usually serrate; opercle without spines, gills 4, a slit behind the last, the rakers moderate; gill-membranes separate, free from the isthmus; lateral line concurrent with the outline of back, usually not extending on caudal fin; scales moderate, firm, ctenoid, present on body, sides of the head and often on the fins; dorsal fin long, more or less deeply notched, the spines strong, depressible in a groove, 10 to 14 in number; caudal fin more or less concave; anal fin with 3 spines, the soft portion similar to that of the dorsal but usually shorter; ventral fins thoracic, with I, 5 rays; air bladder present; intestinal canal short; pyloric cæca few; branchiostegals 6 or 7.

The species of this family are numerous. They inhabit the warm seas and nearly all of them are valued as food.

Key to the Genera.

a. Preopercle strongly serrate, two of the spines at angle enlarged, the serræ on lower margin directed forward; body elongate, not much compressed. *Conodon*, p. 521.

aa. Preopercle rather finely serrate, none of the serræ directed forward; body deeper, more strongly compressed.

b. Soft parts of dorsal and anal densely scaled.

c. Dorsal spines normally 13; body elongate, the back little elevated. *Bathystoma*, p. 523.

cc. Dorsal spines normally 12, occasionally 11 or 13.

d. Series of scales above lateral line parallel with it, those below lateral line horizontal; mouth rather small, oblique. *Orthostœchus*, p. 525.

dd. Series of scales above lateral line more or less oblique, not parallel with it, those below lateral line horizontal or not.

e. Snout short, more than 3 in head; mouth small, more or less oblique; the maxillary rather short, not curved.

f. Body elongate, the back scarcely elevated; mouth slightly oblique; sides with about 5 yellow horizontal stripes. *Brachygenys*, p. 527.

ff. Body rather deeper, the back elevated; mouth notably oblique; scales on sides with pearly gray centers, forming lines along the rows. *Lythrulon,* p. 528.

ee. Snout long, usually 3 or less in head; mouth large, nearly or quite horizontal; maxillary long and curved. *Hæmulon,* p. 529.

bb. Soft parts of dorsal and anal not densely scaled, naked or with small scales on interradial membranes.

g. Body rather elongate; the head long; snout pointed; lips thin.

h. Anal fin long, with III, 10 to 13 rays, the spines small. *Orthopristis,* p. 544.

hh. Anal fin short, with III, 6 to 8 rays, the second spine somewhat enlarged. *Pomadasys,* p. 547.

gg. Body short and deep; head short; snout blunt; lips thick; second anal spine notably enlarged. *Anisotremus,* p. 560.

146. Genus **Conodon** Cuvier & Valenciennes.

Conodon Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 156 (type *Conodon antillanus* Cuvier & Valenciennes = *Perca nobilis* Linnæus).

Body oblong, rather robust; the outer teeth in jaws notably enlarged, conical; preopercle strongly serrate, two of the spines at angle enlarged, the serræ on the lower limb directed forward; soft dorsal and anal more or less scaly; second anal spine enlarged. A single species, occurring on both coasts of Panama, is known.

379. Conodon nobilis (Linnæus).

Perca nobilis Linnæus, Syst. Nat., Ed. X, 1758, 191 (North America).

Sciæna plumieri Bloch, Naturg. Ausl. Fische, VI, 1792, 66, Pl. CCCVI (Antilles).

Sciæna coro Bloch, Naturg. Ausl. Fische, VI, 1792, 70, Pl. CCCVII, fig. 2 (Brazil).

Cheilodipterus chrysopterus Lacépède, Hist. Nat. Poiss., III, 1802, 542, Pl. XXXIII, fig. 1.

Conodon antillanus Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 156 (Jamaica).

Pristipoma coro Cuvier & Valenciennes, Hist Nat. Poiss., V, 1830, 266.

Conodon plumieri Günther, Cat. Fish. Brit. Mus., I, 1859, 304.

Conodon serrifer Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 351 (Boca Soledad, Lower California); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1324.

Conodon nobilis Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 488; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 404 (Colon), and 1917, 132 (Colon).

Head 3.1 to 3.35; depth 2.75 to 3.35; D. XII, 12 or 13; A. III, 7 or 8; scales 50 to 55.

Body elongate, rather robust; the back not greatly elevated; head rather large; snout moderate, 2.8 to 2.9 in head; eye 3.35 to 4.2; mouth rather small, oblique; the lower jaw projecting, more strongly in the young than in adult; maxillary reaching slightly past anterior margin of eye, 2.7 to 2.9 in head; teeth in the jaws conical or pointed, in bands, the outer series notably enlarged; preopercle serrate, with 2 enlarged spines at lower posterior angle, serrations most prominent in young, those on the lower limb directed forward; gill-rakers moderate, proportionately longer in young, 12 to 14 on lower limb of first arch; scales moderate, strongly ctenoid, the series above lateral line parallel with it, 5 rows between the lateral line and origin of dorsal; vertical fins with scales, at least on interradial membranes; dorsal fin long, deeply notched, the spines moderate, the fourth usually the longest, a little shorter than eye and snout, the soft part short, highest anteriorly; caudal fin scarcely forked, the margin merely concave; anal fin with 3 strong spines, the second enlarged, stronger and usually a little longer than the longest dorsal spine; ventral fins moderate, inserted about midway between tip of lower jaw and origin of anal; pectoral fins moderate, 1.1 to 1.35 in head.

Color in life dark brown above, pale yellow below; sides with 8 dark cross-bars; lower part of sides with brown punctulations; dorsal and caudal yellowish green at base, becoming darker on distal parts; anal and ventrals yellowish green; pectorals brownish yellow; very young with 3 or 4 indistinct horizontal dark bands in addition to the dark cross-bars.

We have 14 specimens, ranging in length from 55 to 290 mm. One specimen is from the Pacific coast, where the species appears to be rare. It has previously not been recorded from Panama. On the Atlantic side the species is fairly common, but not abundant. The Pacific coast representatives have been described as a distinct species (*Conodon serrifer* Jordan & Gilbert), but we are unable to separate our Pacific specimen from the others. We also have examined the types (3 specimens) of *C. serrifer* and we find that the alleged differences are not constant. We, therefore, regard the forms found on both coasts as the same.

As here understood, the range of this species on the Atlantic extends from Texas to Brazil, and on the Pacific from Lower California to Panama. Our Atlantic specimens are from Toro Point, Cristobal and Colon. The Pacific specimen was bought in the Panama City market.

147. Genus **Bathystoma** Scudder.

Bathystoma (Scudder) Putnam, Bull. Mus. Comp. Zoöl., I, 1863, 12 (type *Perca melanura* Linnæus = *Hæmulon jeniguano* Poey).

This genus is scarcely separable from *Hæmulon*, but the dorsal spines are normally 13 in number instead of 12. The body is rather more elongate and the back lower; the mouth is red within. A single species was taken on the Atlantic coast of Panama, although one or two others probably occur there.

KEY TO THE SPECIES.

a. Body elongate, the depth 2.85 to 3.1 in length; scales moderate, 50 to 59 in lateral series; a large black caudal spot present. *rimator*, p. 523.

aa. Body very elongate, the depth 3.4 to 3.85 in length; scales small, 65 to 72; caudal spot wanting. *striatum*, p. 524.

380. **Bathystoma rimator** (Jordan & Swain).

Hæmulon chrysopteron Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 240 (brought by Milbert from New York; erroneously identified with *Perca chrysoptera* Linnæus).

Hæmulon chrysopterum Günther, Cat. Fish. Brit. Mus., I, 1859, 313.

Hæmulon quadrilineatum Holbrook, Ichth. South Carolina, Ed. II, 1860, 195, Pl. XXVII, fig. 2 (not of Cuvier & Valenciennes).

Diabasis aurolineatus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 276, 307 (not of Cuvier & Valenciennes).

Diabasis chrysopterus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 553 (not of Cuvier & Valenciennes).

Hæmulon rimator Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 308 (Charleston, S. C.; Key West and Pensacola, Florida).

Bathystoma rimator Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1308, Pl. CCVI, fig. 534.

Head 2.8 to 2.9; depth 2.85 to 3.1; D. XIII, 13 to 15; A. III, 8 or 9; scales 50 to 59.

Body elongate, compressed; dorsal region little elevated; head rather long; snout tapering, 2.3 to 3 in head; eye 3.25 to 3.75; mouth large, terminal, slightly oblique; maxillary reaching to or a little past middle

of eye, 1.8 to 2.1 in head; teeth in the jaws in villiform bands, the outer ones enlarged; preopercle finely serrate; gill-rakers rather short and slender, 13 to 15 on lower limb of first arch; scales moderate, ctenoid, series above lateral line not parallel with it, 6 rows between origin of dorsal and lateral line, 11 between lateral line and origin of anal; vertical fins densely scaled; dorsal fin long, the spines moderate, the fourth the longest, equal to about half the length of head, the soft part low, with convex outline; caudal fin forked, the lobes acute; anal fin with 3 spines of moderate size, the second somewhat enlarged, scarcely as long as the longest dorsal spine, the soft portion short, with concave margin; ventral fins moderate, inserted a little nearer origin of anal than tip of lower jaw; pectoral fins rather short, 1.3 to 1.4 in head.

Color brownish or grayish above, yellowish to silvery below; sides with two yellow stripes, one from interorbital to base of last rays of dorsal, the second along middle of side to base of caudal where it ends in a large, black caudal spot; the stripes are most distinct in the young, the adults becoming plainer; dorsal and caudal dusky, the other fins mostly yellow.

Only 3 specimens, 100 to 130 mm. in length were taken. The species appears to be rare on the coast of Panama.

Known from North Carolina south to Trinidad. Our specimens are from Colon and Porto Bello.

381. Bathystoma striatum (Linnæus).

Perca striata Linnæus, Syst. Nat., Ed. X, 1758, 233 (North America).

Grammistes trivittatus Bloch & Schneider, Syst. Ichth., 1801, 188 (Brazil).

Serranus capeuna Lichtenstein, Abh. Ak. Wiss. Berlin, 1821, 288 (Brazil).

Hæmulon quadrilineatum Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 238, Pl. CXX (San Domingo).

Hæmulon quinquelineatum Poey, Memorias, II, 1861, 419 (Cuba).

Diabasis trivittatus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883. 554 (erroneously ascribed, after Holbrook, to the Carolina fauna).

Hæmulon striatum Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 479.

Bathystoma striatum Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1310.

Head 3.5; depth 3.4 to 3.85; D. XIII, 14; A. III, 8; scales 65 to 72.

Body very elongate, compressed; the back little elevated; head rather long; snout moderate, 3.5 to 3.6 in head; eye 2.6 to 3.35; mouth moderate, terminal, slightly oblique; maxillary scarcely reaching middle of eye, 2.24 to 2.4 in head; teeth in narrow bands, pointed, the outer ones enlarged; preopercle finely serrate; gill-rakers rather long and slender, 18 on lower limb of first arch; scales small, the series above lateral line not parallel with it, 7 or 8 oblique rows between the lateral line and origin of dorsal; vertical fins densely scaled; dorsal fin long, the spines slender, the fourth the longest, nearly as long as eye and snout, the soft part very low; caudal fin rather deeply forked; anal fin with 3 spines, the second not much longer than the third, and notably shorter than the longest dorsal spine; ventral fins moderate, inserted equidistant from tip of lower jaw and origin of anal; pectoral fins rather short, 1.3 to 1.6 in head.

Color in spirits grayish; sides and back with 5 or 6 black longitudinal stripes; no black spot at base of caudal.

This species was not taken on the coast of Panama by us, but we have examined 2 specimens in the National Museum collection, respectively 125 and 155 mm. in length, sent from Cuba by Poey, who identified them as *Hæmulon quadrilineatus*. This name has been referred to the synonymy of *B. striatum* by Jordan & Fesler and others. Whether or not this is correct, we are unable to state, but the specimens examined differ so greatly from *B. rimator* that there is no doubt but what they belong to a species distinct from the latter. We have also examined several specimens in the National Museum sent by Poey from Cuba of *Hæmulon jeniguano*. This name has been referred to the synonymy of *B. aurolineatum* of Cuvier & Valenciennes. We are, however, unable to separate these specimens from *B. rimator*, and although *B. aurolineatum*, as understood by Jordan & Fesler and others, falls within the scope of the present paper, we omit it, except for the mention just made, as we are unable to give its relationship.

Bathystoma striatum, as understood by Jordan & Evermann, 1898, ranges from the Bermuda Islands south to Brazil.

148. Genus **Orthostœchus** Gill.

Orthostœchus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 255 (type *Orthostœchus maculicauda* Gill).

Body rather elongate, compressed; mouth moderate; series of scales above lateral line parallel with it, those below lateral line horizontal; soft dorsal and anal densely scaled. A single species known.

382. Orthostœchus maculicauda Gill.

Orthostœchus maculicauda Gill, Proc. Ac. Nat. Sci. Phila., 1862, 255 (Cape San Lucas).

Hæmulon mazatlanum Steindachner, (Sitzb. k. Ak. Wiss. Wien, LX) Ichth. Notizen, VIII, 1869, 12, Pl. VI (Mazatlan).

Hæmulon maculicauda Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXII) Ichth. Beitr., III, 1875, 14.

Diabasis maculicauda Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 362, 372, 626.

Orthostœchus maculicauda Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1313; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 106 (Panama Bay).

Head 3.05 to 3.2; depth 2.8 to 3.15; D. XIII, 15 or 16; A. III, 9 or 10; scales 50 to 54.

Body moderately elongate; the back not greatly elevated; head moderate; snout rather pointed, 2.15 to 3.5 in head; eye 3 to 3.85; mouth moderate, terminal, oblique; maxillary reaching nearly or quite to pupil, 2.5 to 2.8 in head; teeth in the jaws in narrow villiform bands, the outer ones scarcely enlarged; preopercle serrate; gill-rakers moderate, proportionately longer in young than in adult, 15 to 17 on lower limb of first arch; scales rather large, series above lateral line parallel with it, 5 or 5½ rows between lateral line and origin of dorsal; vertical fins densely scaled; dorsal fin long, the spines moderate, the third or fourth the longest, equal to length of snout and half the eye, the soft part low, with convex margin; caudal fin forked, both lobes acute; anal fin with 3 spines, the second the largest, equal to or a little longer than snout; ventral fins inserted a little nearer origin of anal than tip of lower jaw; pectoral fins moderate, 1.2 to 1.35 in head.

Color grayish brown; each scale on back and sides with a pearly gray spot in center, forming distinct lines along the rows of scales; base of caudal with a distinct spot in young, becoming proportionately larger and less distinct with age; dorsal, caudal and anal slightly dusky, the other fins mostly plain translucent.

This species is represented by 10 specimens, ranging in length from 85 to 230 mm. This fish is apparently rather rare on the coast of Panama and it is only occasionally seen in the market.

Known from Guaymas to Panama. Our specimens are from Taboga Island, Balboa and Panama City.

149. Genus **Brachygenys** Scudder.

Brachygenys (Scudder) Poey, Syn. Pisc. Cub., 1868, 310 (type *Hæmulon tæniatum* Poey).

Body slender; snout short and blunt; mouth small; the maxillary reaching but little beyond the anterior margin of eye, about one-third the length of head; mouth red within. Other characters mostly as in *Hæmulon*. A single species is known.

383. **Brachygenys chrysargyreus** (Günther).

Hæmulon chrysargyreum Günther, Cat. Fish. Brit. Mus., I, 1859, 314 (Trinidad); Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 476.

Brachygenys chrysargyreus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1307, Pl. CCVI, fig. 533; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 402 (Colon).

Head 3 to 3.25; depth 2.9 to 3.25; D. XII, 13; A. III, 9 or 10; scales 53 to 60.

Body elongate, compressed; the back not greatly elevated; anterior profile evenly convex; head rather long; snout moderately blunt, apparently blunter in female than in the male, 3.1 to 3.5 in head; eye 2.7 to 3.05; mouth rather small, terminal, slightly oblique; maxillary reaching slightly past anterior margin of eye, 2.85 to 3.1 in head; teeth in the jaws in bands, the outer ones scarcely enlarged; preopercle finely serrate; gill-rakers short, 16 to 18 on lower limb of first arch; scales moderate, strongly ctenoid, series above lateral line not parallel with it, 6 or 7 oblique rows between lateral line and origin of dorsal; vertical fins densely scaled; dorsal fin long, deeply notched, the spines rather weak, the fourth the longest, equal to length of snout and two-thirds the eye, the soft part rather low, highest anteriorly; caudal fin deeply forked, both lobes acute; anal fin with 3 stiff spines, the second and third of nearly equal length, as long as eye, the soft part short, with concave margin; ventral fins small, inserted about equidistant from tip of lower jaw and origin of anal; pectoral fins short, 1.2 to 1.4 in head.

Color in spirits grayish above, silvery below; sides with about 5 yellow horizontal stripes which are scarcely half as broad as the interspaces; dorsal dusky; other fins plain translucent; axil of pectoral dusky.

This species is represented by 36 specimens, ranging in length from 128 to 190 mm. It appears to inhabit chiefly coral reefs. Spawning occurs in the spring, as specimens taken from March to May

have the sexual organs well distended with eggs and milt. The alimentary canal is very short and the stomach is provided with 6 pyloric cæca. The species is not abundant.

Known from Florida to Brazil. Our specimens are from Colon and Porto Bello.

150. Genus **Lythrulon** Jordan & Swain.

Lythrulon Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 287 (type *Hæmulon flaviguttatus* Gill).

Body elongate, compressed; the back not greatly elevated; snout short; mouth notably oblique; gill-rakers rather numerous, about 18 on lower limb of first arch; scales moderate, the series above lateral line not parallel with it; dorsal and anal fins long and low; caudal fin deeply forked. A single species is known which is rather common on the west coast of Mexico and Central America.

384. **Lythrulon flaviguttatum** (Gill).

Hæmulon flaviguttatus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 254 (Cape San Lucas); Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXII) Ichth. Beitr., III, 1875, 14 (Acapulco; Altata; Mazatlan; Panama).

Hæmulon margaritiferum Günther, Proc. Zoöl. Soc. London, 1864, 147 (Panama).

Hæmulon flaviguttatum Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 314.

Lythrulon opalescens Jordan & Starks, in Jordan, Proc. Cal. Ac. Sci., 2nd Ser., 1895, 459, Pl. XL (Mazatlan).

Lythrulon flaviguttatum Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1312; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 105 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 115 (Acapulco; Perico Island); Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 410 (Panama).

Head 3.1 to 3.6; depth 2.65 to 3.3; D. XII, 16 to 18; A. III, 10 or 11; scales 50 to 57.

Body elongate, compressed; the back elevated; anterior profile straight or slightly concave over snout, convex at nape; head moderate; snout short, 3.5 to 4.2 in head; eye 2.7 to 3.7; mouth rather small, terminal, notably oblique; maxillary reaching anterior margin of pupil, 2.4 to 2.6 in head; teeth in the jaws in villiform bands, none of them enlarged; preopercle serrate; gill-rakers rather long, 16 to 18 on lower limb of first arch; scales moderate, the series above lateral line not parallel with it, 6 or 7 rows between the lateral line and origin of dorsal;

vertical fins densely scaled; dorsal fin long, not very deeply notched, the third or fourth spine longest, not quite as long as eye and snout, the soft part of fin low, with convex margin; caudal fin forked, the upper lobe the longer; anal fin with 3 spines, the second slightly enlarged, stronger but much shorter than the longest dorsal spine; ventral fins moderate, inserted a little nearer origin of anal than the tip of lower jaw; pectoral fins usually about equal to length of head, 3.35 to 4.55 in body.

Color brownish to silvery gray; each scale on sides with a pearly center, forming lines along the rows of scales. Young of 60 mm. and less in length with 3 longitudinal black stripes and a jet black caudal spot. The caudal spot is much more persistent than the black stripes, but it becomes indistinct or disappears wholly in large examples. Membrane under preopercle black; dorsal, caudal and anal dusky; the other fins mostly pale.

We preserved 48 specimens of this species, ranging in length from 40 to 415 mm. The species is rather common about Panama City and is frequently seen in the Panama City market.

Known from Guaymas to Panama. Our specimens are from Taboga Island, Naos Island, Balboa and Panama City.

151. Genus **Hæmulon** Cuvier.

Hæmulon Cuvier, Règne Animal, Ed. II, II, 1829, 175 (type *Hæmulon elegans* Cuvier = *Sparus sciurus* Shaw).

Body oblong; the back more or less elevated; snout long; mouth large, terminal, nearly horizontal; maxillary long, curved, reaching to below eye; no teeth on vomer or palatines; teeth in the jaws in narrow villiform bands, the outer ones more or less enlarged; preopercle serrate; gill-rakers rather short; chin with a central groove behind the symphysis; scales above lateral line in series not parallel with it; soft parts of vertical fins densely scaled; dorsal fin more or less deeply notched; dorsal spines 12, rarely 11; caudal fin more or less forked; anal fin with 3 spines, the second one enlarged, usually larger than the third; mouth red within.

KEY TO THE SPECIES.

a. Scales below lateral line notably enlarged, very deep; sides with yellow stripes, parallel with the lateral line above it, very oblique below it. *flavolineatum*, p. 531.

aa. Scales below lateral line not especially enlarged.

b. Scales above lateral line enlarged, 4 rows between the lateral line and origin of dorsal; sides with about 12 well defined, more or less wavy, horizontal blue stripes, not extending beyond head on body. *plumierii*, p. 532.

bb. Scales above lateral line not enlarged, not fewer than 5 series between lateral line and origin of dorsal.

c. Sides without dark cross-bars.

d. Maxillary reaching nearly or quite to middle of eye, 1.9 to 2.3 in head; sides with blue, black or golden horizontal stripes.

e. Gill-rakers on lower limb of first arch 16 to 18 in number; sides with black or blue stripes.

f. Soft dorsal with strongly convex margin, the anterior rays scarcely longer than the posterior ones; head and body with about 10 horizontal blue stripes, becoming pale but not disappearing in spirits, well defined on snout and cheeks. *sciurus*, p. 533.

ff. Soft dorsal with nearly straight margin, the anterior rays nearly twice as long as the posterior ones; upper part of sides with 4 or 5 dark stripes present at all ages, no stripes on snout and cheeks. *macrostomum*, p. 535.

ee. Gill-rakers fewer, 12 to 14 on lower limb of first arch; a dark band along base of dorsal and upper surface of caudal peduncle to base of caudal fin; another dark band from snout through eye directly to base of caudal; sides with about 10 golden stripes, fading in alcohol. *melanurum*, p. 536.

dd. Maxillary reaching to or slightly past anterior margin of eye, 2 to 2.8 in head; sides with more or less distinct dark or pearly gray stripes following the rows of scales (except in *H. carbonarium*, which has horizontal bronze stripes).

g. Sides with horizontal bronze stripes, fading but not disappearing in spirits, these not present on snout and cheeks; gill-rakers on lower limb of first arch 13 or 14 in number; 6 or 7 oblique rows of scales between lateral line and origin of dorsal. *carbonarium*, p. 537.

gg. Sides with dark or pearly gray stripes following the rows of scales.

h. Color silver-gray; rows of scales marked by distinct pearly gray stripes; caudal spot present at all ages; mouth rather large, the maxillary 2 to 2.1 in head; snout long, pointed, 2.55 to 2.8 in head. *steindachneri*, p. 537.

hh. Color darker; rows of scales marked by more or less distinct dark stripes; caudal spot wanting in adult; mouth smaller, the maxillary 2.2 to 2.8 in head.

i. Pectoral fins densely scaled; 5 oblique rows of scales between lateral line and origin of dorsal; rows of scales on sides with faint dark stripes. *parra*, p. 539.

ii. Pectoral fins with a few scales at base, the rest of the fin naked.

j. Dorsal fin scarcely notched, the last two spines of about equal length, the soft part very low; 7 oblique rows of scales between lateral line and origin of dorsal; caudal fin rather deeply forked; rows of scales marked with indistinct dark stripes. *album*, p. 540.

jj. Dorsal fin rather deeply notched, the last spine longer than the preceding one, the soft part higher; 5 or 6 oblique rows of scales between the lateral line and origin of dorsal.

k. Rows of scales on sides very distinctly marked by continuous dark lines, wavy above the lateral line; dorsal spines normally 12; caudal fin emarginate, but scarcely forked. *bonariense*, p. 541.

kk. Rows of scales on sides marked by well separated round spots, one on each scale, most distinct and not wavy above lateral line; dorsal spines more usually 11 than 12; caudal fin rather deeply forked. *scudderii*, p. 542.

cc. Sides with 6 broad black cross-bars; a few dark spots on head behind eye; 7 oblique rows of scales between lateral line and origin of dorsal; 12 gill-rakers on lower limb of first arch. *sexfasciatum*, p. 543.

385. Hæmulon flavolineatum (Desmarest). (Plate LIII.)

Diabasis flavolineatus Desmarest, Prem. Déc. Ichth., 1823, 35, Pl. II, fig. 1 (Cuba).

Hæmulon heterodon Cuvier, Règne Animal, Ed. II, II, 1829, 176 (Cuba).

Hæmulon xanthopteron Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 254 (Martinique).

Hæmulon xanthopterum Günther, Cat. Fish. Brit. Mus., I, 1859, 312.

Hæmulon flavolineatum Poey, Repertorio, 1867, 309; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1306; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 402 (Colon), and 1917, 132 (Colon).

Head 2.8 to 3.1; depth 2.5 to 2.85; D. XII, 14 or 15; A. III, 7 or 8; scales below lateral line 47 to 53.

Body moderately elongate, compressed; anterior profile convex to nearly straight over snout and eye in adult, strongly convex at nape; head rather deep; snout moderate, 2.4 to 2.9 in head; eye 3 to 3.4; mouth large, terminal, nearly horizontal; maxillary reaching to or slightly past anterior margin of pupil, 2.15 to 2.4 in head; teeth in the jaws in bands, the outer ones somewhat enlarged; preopercle serrate; gill-rakers rather short, 13 or 14 on lower limb of first arch; scales moderate, notably enlarged below lateral line, the series everywhere oblique except on belly and caudal peduncle, 5 rows between the lateral line and origin of dorsal; soft parts of vertical fins densely scaled, the other fins mostly naked; dorsal fin long, moderately notched, the fourth spine the longest, equal to snout and about one-third the eye, the soft part with convex outline; caudal fin rather deeply forked; anal fin with 3 spines, the second enlarged, reaching slightly past the tip of the third when deflexed, quite as long as the longest dorsal spine; ventral fins inserted slightly nearer origin of anal than tip of lower jaw; pectoral fins 1.1 to 1.4 in head.

Color of fresh specimen greenish, with yellow longitudinal stripes, those above lateral line parallel with it, those below lateral line quite oblique; pectorals pale; other fins yellowish green. Young of 90 mm. and less in length with 3 dark longitudinal stripes, and a black caudal spot.

We preserved 55 specimens, ranging in length from 83 to 200 mm. This species is quite common on the coral reefs on the Atlantic coast of Panama. It does not seem to reach as large a size as the other species of the genus in this locality. It is only occasionally seen in the market. A specimen taken in March has the ovaries well distended with eggs.

Known from Florida to Brazil. Our specimens were taken at Toro Point, Colon and Porto Bello.

386. Hæmulon plumierii (Lacépède).

Labrus plumierii Lacépède, Hist. Nat. Poiss., III, 1802, 480, Pl. II, fig. 2 (Martinique; based on a drawing by Plumier).

Hæmulon formosum Cuvier, Règne Animal, Ed. II, II, 1829, 175 (Martinique).

Hæmulon arcuatum Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 1833, 481 (Charleston, South Carolina).

Hæmulon arara Poey, Memorias, II, 1860, 177 (Cuba).

Hæmulon subarcuatum Poey, Memorias, II, 1861, 419 (Cuba).

Diabasis plumieri Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 603.

Hæmulon plumieri Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1304, Pl. CCV, fig. 532; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 402 (Colon).

Head 2.7 to 2.8; depth 2.4 to 2.5; D. XII, 15 or 16; A. III, 8 or 9; scales 49 to 53.

Body elongate, compressed; the back elevated; anterior profile concave over snout and eyes in adult, evenly convex in young; head deep; snout long, pointed, 1.9 to 2.3 in head; eye 3.9 to 5.2; mouth large, terminal, horizontal; maxillary reaching nearly or quite to middle of eye, 1.9 to 2.05 in head; teeth in the jaws in villiform bands, the outer series somewhat enlarged; preopercle finely serrate; gill-rakers rather short, 14 or 15 on lower limb of first arch; scales moderate, those above lateral line enlarged, the series very oblique, 4 rows between the lateral line and origin of dorsal; pectoral fins with scales at the base only; the soft parts of the other fins all densely scaled; dorsal fin long, scarcely notched, the fourth spine the longest, scarcely as long as snout, the soft part with convex outline; caudal fin forked, the upper lobe the longer; anal fin with 3 spines, the second the strongest, reaching slightly past the tip of the third when the fin is deflexed, a little shorter than the longest dorsal spine; ventral fins inserted notably nearer origin of anal than tip of lower jaw; pectoral fins moderate, 1.3 to 1.6 in head.

Color in alcohol grayish brown; scales on sides each with a large silvery area, with brown bases and margins; sides of head with about 12 more or less wavy horizontal blue stripes, separated by paler interspaces. These stripes are bright blue in life and the interspaces are brassy. They do not extend beyond head on body. The vertical fins are dusky; the paired fins are mostly pale. The inside of the mouth is red in life.

We preserved 42 specimens of this species, ranging in length from 115 to 290 mm. The species is fairly common, although not abundant on the Atlantic coast of Panama.

Known from North Carolina south to Brazil. Our specimens are from Toro Point, Colon and Porto Bello.

387. Hæmulon sciurus (Shaw).

Anthias formosus Bloch, Naturg. Ausl. Fische, VI, 1792, 122, Pl. CCCXXIII (East Indies and Atlantic Ocean; not *Perca formosa* Linnæus, which is *Diplectrum formosum*).

Sparus sciurus Shaw, Gen. Zoöl., IV, 1803, Pl. LXIV (Antilles; based on *Anthias formosus* Bloch).

Hæmulon elegans Cuvier, Règne Animal, Ed. II, II, 1829, 175 (no description, based on figure of Bloch).

Hæmulon similis Castelnau, Anim. Nouv. Rares Amér. Sud, 1855, 11 (Bahia).

Hæmulon luteum Poey, Memorias, II, 1860, 174 (Cuba).

Hæmulon multilineatum Poey, Memorias, II, 1860, 178 (Cuba).

Hæmulon hians Haly, Ann & Mag. Nat. Hist., Ser. 4, XV, 1875, 268 (Bahia).

Diabasis elegans Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 923.

Hæmulon sciurus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1303, Pl. CCV, fig. 531.

Head 2.7 to 2.8; depth 2.6 to 2.7; D. XII, 16 or 17; A. III, 8 or 9; scales 48 to 57.

Body elongate, compressed; the back moderately elevated; anterior profile convex over eyes and snout, never concave; head deep; snout long, 2.2 to 2.4 in head; eye 3.6 to 4.3; mouth large, terminal, nearly horizontal; maxillary reaching to or slightly past anterior margin of pupil, 1.9 to 2 in head; teeth in jaws in narrow villiform bands, the outer ones somewhat enlarged; preopercle finely serrate; gill-rakers rather short, 16 to 18 on lower limb of first arch; scales rather small, those above lateral line anteriorly rather smaller than those below it, the series quite oblique, 6 or 7 rows between the lateral line and the origin of the dorsal; pectoral fins with scales at base but with few or none on distal parts, the soft portion of the other fins densely scaled; dorsal fin long, not deeply notched, the fourth spine usually the longest, equal to or a little shorter than the snout, the soft part with a strongly convex outline, the anterior rays scarcely higher than the posterior ones; caudal fin forked, the upper lobe the longer; anal fin with 3 spines, the second the longest, reaching to or slightly past the tip of the third when deflexed, of about the same length as the longest dorsal spine; ventral fins inserted notably nearer origin of anal than tip of lower jaw; pectoral fins moderate, 1.3 to 1.55 in head.

Color yellowish; sides of body and head with about 10 blue horizontal stripes, the one below the eye arched, wavy; spinous dorsal pale yellow, with orange border; soft dorsal greenish, with orange border; caudal fin dusky at base, the distal part yellowish green; anal yellowish green; ventrals and pectorals light yellow; inside of mouth deep red. In the young (58 mm. long) the blue stripes on head and sides are very indistinct, and there is an indication of a dark bar extending along median line of side.

This species is represented by 15 specimens, ranging in length from 58 to 305 mm. It is apparently less abundant than *H. plumierii*.

Known from Florida to Brazil. Once recorded from the Atlantic coast of Panama by Haly, 1875. Our specimens are from Toro Point, Colon and Porto Bello.

388. Hæmulon macrostomum Günther.

Hæmulon macrostoma Günther, Cat. Fish. Brit. Mus., I, 1859, 308 (Jamaica).

Hæmulon fremebundum Goode & Bean, Proc. U. S. Nat. Mus., 1879, 340 (Clearwater Harbor, Florida).

Diabasis fremebundus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 554.

Hæmulon macrostomum Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1296, Pl. CCIV, fig. 529.

Head 2.6 to 2.8; depth 2.4 to 2.55; D. XII, 15 to 17; A. III, 8 or 9; scales 50 to 60.

Body moderately elongate, compressed; anterior profile nearly straight and oblique over snout and eyes, strongly convex at nape; head rather deep; snout long, tapering, 2.2 to 2.5 in head; eye 3.1 to 4.4; mouth large, terminal, horizontal; maxillary reaching nearly or quite opposite middle of eye, 1.9 to 2.3 in head; teeth in the jaws in narrow villiform bands, the outer teeth enlarged; preopercular margin very finely serrate; gill-rakers short, 16 or 17 on lower limb of first arch; scales moderate, the series above lateral line oblique, 7 rows between the lateral line and origin of dorsal; pectoral fins with small scales on base only; other fins completely scaled; dorsal fin long, the third or fourth spine the longest, equal to length of snout in adult, proportionately longer in young, the margin of fin nearly straight, the anterior rays about twice as long as the posterior ones; caudal fin forked, the upper lobe the longer; anal fin with 3 spines, the second enlarged, but not reaching past the tip of the third, a little shorter than the longest dorsal spine; ventral fins inserted a little nearer origin of anal than tip of lower jaw; pectorals moderate, 1.2 to 1.87 in head.

Color in life bluish black above, brownish below; back with a black median stripe, at each side of it a broad yellowish green band; sides with alternating dark stripes and pale blue bands, indistinct or more usually wanting on lower half; scales mostly with pearly centers; upper margin of eye reddish brown, lower margin golden; spinous

dorsal brownish green, with golden margin; soft dorsal dark at base, elsewhere greenish yellow; caudal fin with a distinct spot at base in young, becoming obscure and much enlarged with age, spreading over base of fin, the distal portion of fin yellowish green; anal fin dark brown, with the last rays and the margin yellow; ventrals black with pale outer margin; pectorals orange. The dark longitudinal stripes in this species do not disappear with age as in related species. They, however, are much more distinct in some specimens than in others, but apparently never wanting.

We preserved 92 specimens, ranging in length from 69 to 285 mm. It was found abundant on the coral reefs, but was not taken elsewhere.

Recorded from Florida, the West Indies, the coast of Panama, and Cartagena, Colombia. Our specimens were taken at Toro Point, Colon and Porto Bello.

389. Hæmulon melanurum (Linnæus).

Perca melanura Linnæus, Syst. Nat., Ed. X, 1758, 292; Ed. XII, 1766, 486 (Bahamas).

Hæmulon schranki Agassiz, in Spix, Pisc. Brasil., 1831, 121, Pl. LXIX (Brazil).

Hæmulon dorsale Poey, Memorias, II, 1860, 179 (Cuba).

Hæmulon melanurum Cope, Trans. Amer. Philo. Soc. Phila., XIV, 1871, 471; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1302.

Head 2.8 to 3; depth 2.65 to 2.95; D. XII, 15 or 16; A. III, 7 or 8; scales below lateral line 50 to 55.

This species was not taken on the coast of Panama, but we have examined specimens in the National Museum from the Bahama Islands and from Cozumel. It is rather closely related to *H. sciurus,* from which it may, however, be distinguished by the fewer gill-rakers and by the color. In *H. melanurum* there are from 12 to 14 gill-rakers on the lower limb of the first arch, while in *H. sciurus* there are 16 to 18. *H. melanurum* is described as having about 10 horizontal golden stripes in life. These fade in spirits; a dark band extends from the snout through eye to caudal peduncle. At the base of the dorsal is a black stripe which extends along the upper surface of the caudal peduncle and forks on the base of the caudal fin, the branches extending on the caudal lobes.

Recorded from the Bahama Islands south to Brazil.

390. Hæmulon carbonarium Poey.

Hæmulon carbonarium Poey, Memorias, II, 1860, 176 (Cuba); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1300.

Head 2.7 to 2.95; depth 2.45 to 2.8; D. XII, 15 or 16; A. III, 7 or 8; scales 52 to 60.

Body elongate, compressed; the back elevated, anterior profile nearly straight over snout, slightly swollen between eyes, convex at nape; head rather large; snout long, 2.3 to 2.6 in head; eye 3.05 to 3.5; mouth large, terminal, nearly horizontal; maxillary reaching slightly past anterior margin of eye, 2.15 to 2.4 in head; teeth in the jaws in villiform bands, the outer ones notably enlarged; preopercle finely serrate; gill-rakers short, 13 or 14 on lower limb of first arch; scales moderate, the series above lateral line very oblique, 6 or 7 rows between the lateral line and origin of dorsal; the fins all densely scaled in adult, the pectorals only partly scaled in young; dorsal fin long, moderately notched, the third or fourth spine the longest, slightly exceeding the length of snout, the soft part with convex margin; caudal fin moderately forked, the lobes rather acute; anal fin with 3 spines, the second the largest, usually reaching the tip of the third when deflexed, equal to length of snout; ventral fins inserted a little nearer origin of anal than tip of lower jaw; pectoral fins moderate, 1.2 to 1.4 in head.

Color bluish above, pale brown below; sides with bronze longitudinal stripes which become faint but do not disappear in spirits; sides of head with faint dark lines; upper margin of eye rusty red; mouth bright red; spinous dorsal reddish brown; soft dorsal dark brown with deep red on base and margin; caudal dark brown at base, becoming paler distally; anal dark brown with narrow pale margin; ventrals and pectorals brownish.

This species is represented by 29 specimens, ranging in length from 170 to 275 mm. It seems to inhabit mostly rocky bottom. It is apparently not very common and is rarely seen in the market. A specimen taken in April has the ovaries well distended with eggs. We have at hand the type of this species for comparison, with it our specimens agree perfectly.

Known from the Bermuda Islands south to Brazil. Our specimens were taken at Toro Point, Colon and Porto Bello.

391. Hæmulon steindachneri (Jordan & Gilbert).

Hæmulon caudimacula Steindachner, (Sitzb. k. Ak. Wiss. Wein, LXXII) Ichth. Beitr., III, 1875, 15 (not of Cuvier & Valenciennes).

Diabasis steindachneri Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 322 (Panama; Mazatlan).

Hæmulon steindachneri Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 299; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1301; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 105 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 115 (Acapulco; Perico Island, Panama Bay).

Hæmulon schranki Evermann & Jenkins, Proc. U. S. Nat. Mus., 1891, 153 (not of Agassiz); Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 473 (not of Agassiz).

Head 2.75 to 2.95; depth 2.7 to 2.85; D. XII, 15 to 17; A. III, 8 or 9; scales 53 to 62.

Body elongate, compressed; the back not greatly elevated; anterior profile evenly convex; head rather long; snout pointed, 2.55 to 2.8 in head; eye 3.6 to 4; mouth rather large, terminal, nearly horizontal; maxillary reaching slightly past anterior margin of eye, 2 to 2.1 in head; teeth in the jaws in narrow villiform bands, the outer ones slightly enlarged; preopercle rather strongly serrate; gill-rakers small, 12 or 13 on lower limb of first arch; scales moderate, the series above lateral line very oblique, the row beginning at scapular scale ending in advance of middle of spinous dorsal, 5 or 6 oblique rows between the lateral line and the origin of the dorsal; pectorals with a few scales at base, the other fins mostly covered with scales; dorsal fin long, moderately notched, the fourth spine longest, equal to length of snout and one-third the eye, the soft part with convex margin; caudal fin forked, both lobes acute; anal fin with 3 spines, the second enlarged, reaching past the tip of the third when deflexed, as long as the longest dorsal spine; ventral fins inserted about midway between tip of lower jaw and origin of anal or slightly nearer the latter; pectoral fins rather long, 1.05 to 1.27 in head.

Color in spirits grayish above, silvery below; scales on sides with pearly gray centers, forming distinct lines along the rows of scales; base of caudal black at all ages; fins otherwise plain.

Seven specimens, ranging in length from 170 to 235 mm., were secured on the Pacific coast, but the species was not seen on the Atlantic coast. We have compared our specimens with 3 specimens from Brazil and find them identical.

Known on the Pacific coast from Guaymas to Panama and on the Atlantic coast from St. Lucia to Rio de Janeiro. Our specimens were all purchased in the Panama City market where the species is only occasionally seen.

392. Hæmulon parra (Desmarest).

Diabasis parra Desmarest, Prem. Déc. Ichth., 1823, 30, Pl. II, fig. 2 (Havana).

Hæmulon caudimacula Cuvier, Règne Animal, Ed. II, II, 1829, 176 (Brazil; Havana).

Hæmulon chromis Broussonet, MS., in Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 242 (Jamaica).

Hæmulon canna Agassiz, in Spix, Pisc. Brasil., 1831, 130, Pl. LXIX (not of Cuvier & Valenciennes).

Diabasis chromis Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 924.

Hæmulon parra Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 471; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1297, Pl. CCIV, fig. 530; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 402 (Colon), and 1917, 132 (Colon).

Head 2.8 to 2.9; depth 2.5 to 2.7; D. XII, 17; A. III, 8; scales 50 to 52.

Body moderately deep, compressed; anterior profile gently convex; head rather deep; snout moderate, 2.4 to 2.75 in head; eye 3.2 to 3.85; mouth moderate, terminal, nearly horizontal; maxillary reaching vertical from anterior margin of eye in adult and to pupil in young, 2.3 to 2.6 in head; teeth in narrow villiform bands, the outer ones scarcely enlarged; preopercle serrate; gill-rakers short, 13 or 14 on the lower limb of the first arch; scales moderate, the series above the lateral line very oblique and wavy, 5 or 5½ rows between the lateral line and the origin of dorsal; fins all very densely scaled; dorsal fin long, the third spine longest, equal to length of snout in adult, proportionately longer in young, the soft dorsal with a convex outline; caudal fin deeply emarginate; anal fin with 3 spines, the second somewhat enlarged, scarcely as long as the longest dorsal spine; ventral fins inserted a little nearer origin of anal than tip of lower jaw; pectoral fins rather short, 1.45 to 1.55 in head.

Color grayish brown; rows of scales on sides marked by indistinct dark lines. Young with 3 or 4 dark longitudinal bars; the lower one, which extends from snout through eye to base of caudal, is most peristent; present in specimens up to 115 mm. in length. Young also with a distinct black caudal spot.

We have seven specimens, ranging in length from 30 to 240 mm., which we refer to this species. As here understood, *H. parra* is much less abundant on the coast of Panama than *H. bonariense*. This species differs from *H. bonariense* in the more densely scaled fins,

particularly the pectorals, which in *H. bonariense* are almost wholly naked but are fully scaled in the adult of the present species. The black lines along the rows of scales are much less distinct in *H. parra*. The young of the two species are extremely hard to separate, for the distinctive characters just mentioned are not well developed until the fish reaches a length of more than 100 mm.

Recorded from Florida south to Brazil. Our specimens were taken at Toro Point and Colon.

393. Hæmulon album Cuvier & Valenciennes.

Perca gibbosa Walbaum, Artedi Piscium, Pt. IV, 1792, 348 (not *Perca gibbosa* Linnæus, which is *Lepomis gibbosus*).

Calliodon gibbosus Bloch & Schneider, Syst. Ichth., 1801, 312.

Hæmulon album Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 241 (St. Thomas); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1295, Pl. CCIII, fig. 528.

Hæmulon microphthalmum Günther, Cat. Fish. Brit. Mus., I, 1859, 306 (America).

Hæmulon gibbosum Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 290.

Head 2.85; depth 2.47; eye 4.35 in head; snout 2.5; maxillary 2.43; D. XII, 17; A. III, 8; scales 53.

This species is not recorded from the coast of Panama, but it is here included because its range brings it within the scope of the present work. We have examined a single specimen, 185 mm. in length, from Havana, Cuba. It appears to differ from related species in the less deeply notched dorsal fin, the last two spines being of about equal length, while in related species the last one is longer than the one preceding it. The soft dorsal is very low, and its margin is convex. The caudal fin is rather deeply forked, as in *H. scudderii*. The second anal spine is not very strong but it reaches beyond the tip of the third when the fin is deflexed. The pectoral fins appear to be shorter than in related species and they are devoid of scales, except at base, and are contained 1.35 times in head. The scales above lateral line are in oblique series, there being 7 between the lateral line and the origin of the dorsal. The gill-rakers are small, 13 on the lower limb of the first arch. The color of the old specimen at hand is pale gray; the scales have slightly darker bases but there are no bars or spots on head or body.

Known from Florida to Brazil.

394. Hæmulon bonariense Cuvier & Valenciennes. (Plate LIV, fig. 1.)

Hæmulon bonariense Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 254 (Buenos Ayres); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1297.

Hæmulon canna Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 233 (Martinique; not of Agassiz).

Head 2.7 to 2.9; depth 2.27 to 2.7; D. XII, 15 to 17; A. III, 8 or 9; scales 43 to 50.

Body moderately deep, compressed; anterior profile evenly convex; head compressed; snout rather long, 2.3 to 3.2 in head; eye 3.05 to 4.65; mouth moderate, slightly oblique, terminal; maxillary scarcely reaching anterior margin of eye in large specimens, to anterior margin of pupil in young, 2.5 to 2.8 in head; teeth in the jaws in villiform bands, the outer ones scarcely enlarged; preopercle serrate; gill-rakers short, 12 to 14 on lower limb of first arch; scales moderate, the series above lateral line oblique and wavy, variable, the series beginning at scapula ascending rapidly, ending under or in advance of middle of base of spinous dorsal in some specimens, ending behind origin of soft dorsal in others; 5 or 6 oblique rows of scales between the lateral line and origin of dorsal; all the fins except the pectorals densely scaled; dorsal fin long, the spines moderate, the third the longest, equal to length of snout in adult, proportionately longer in young, the outline of the soft dorsal strongly convex; caudal fin deeply emarginate; anal fin with 3 spines, the second enlarged, nearly or quite as long as the longest dorsal spine; ventral fins inserted a little nearer origin of anal than tip of lower jaw; pectoral fins moderate, 1.1 to 1.4 in head.

Color dark grayish above, silvery below; rows of scales on sides marked by very distinct dark rusty brown lines, formed by spots on the skin underneath the scales. Young of 70 mm. and less in length with 3 or 4 black longitudinal stripes, the lower one extending from snout through eye to base of caudal is broadest and most distinct. This stripe persists in specimens up to 115 mm. in length. In the young there is a very distinct caudal spot present, which remains visible in specimens up to 140 mm. in length. Pectoral fins plain translucent; other fins all dusky.

Over 100 specimens of this species, ranging in length from 28 to 380 mm., were preserved. It is seen in the market daily and is of considerable commercial importance. There seems to be much doubt as to the true relationship of this species and *H. parra*. The obliqueness of the rows of scales above the lateral line, which has been men-

tioned by authors as a distinctive character, is shown by our large series to be of no value, as it is extremely variable. We have referred to this species all specimens having the pectorals scaleless, except for a few small scales on the base of the fins and those that have the dark lines along the rows of scales very distinct. Those having the pectoral fins densely scaled and the dark lines indistinct, we have referred to *H. parra.*

Recorded from the West Indies south to Buenos Ayres. Our specimens are from Toro Point, Colon and Porto Bello.

395. Hæmulon scudderii Gill. (Plate LIV, fig. 2.)

Hæmulon scudderii Gill, Proc. Ac. Nat. Sci. Phila., 1862, 253 (Cape San Lucas).

Hæmulon scudderi Jordan & Evermann, Bull U. S. Nat. Mus., XLVII, 1898, 1299; Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 335, 1899, 3 (Sta. Elena Bay, Ecuador); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 104 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 115 (Acapulco; Perico Island, Panama Bay).

Hæmulon brevirostrum Günther, Trans. Zoöl. Soc. London, VI, 1869, 418 (Panama).

Hæmulon undecimale Steindachner, (Sitzb. k. Ak. Wiss. Wien., LX) Ichth. Beitr., III, 1875, 11 (Acapulco; Panama).

Diabasis scudderi Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 361, 626.

Head 2.85 to 3.05; depth 2.45 to 2.7; D. usually XI, occasionally XII, 15 or 16; A. III, 7 or 8; scales 47 to 53.

Body elongate, compressed; the back moderately elevated; head deep, compressed; snout rather long, 2.75 to 3.25 in head; eye 2.8 to 5.35; mouth moderate, terminal, nearly horizontal; maxillary reaching slightly past anterior margin of eye, 2.2 to 2.45 in head; teeth in the jaws in narrow villiform bands, the outer ones scarcely enlarged; preopercle finely serrate; gill-rakers very short, 11 to 13 on lower limb of first arch; scales moderate, the series above lateral line very oblique, more so than in any of the related species, the series beginning with the scapular scale ending at base of sixth dorsal spine or in advance of this point, not wavy as in related species, 5 or 6 oblique rows between the lateral line and origin of dorsal; pectoral fins with a few scales on base; other fins covered with scales in adult; dorsal fin long, the third spine the longest, equal to length of snout in adult, proportionately longer in young, the soft part with strongly

convex margin; caudal fin forked, notably more so than in related species; anal fin with 3 spines, the second enlarged, not much shorter than the longest dorsal spine; ventral fins inserted a little nearer origin of anal than tip of lower jaw; pectoral fins moderate, 1.2 to 1.35 in head.

Color silvery gray to dark gray; rows of scales on sides marked by round black spots on the skin underneath the scales. These spots are never coalesced and do not form continuous streaks. Young with 4 black longitudinal stripes; the lower one, which extends from snout through eye to the base of the caudal, is the most persistent, being visible in specimens up to 115 mm. in length. The young also possess a distinct caudal spot which becomes obscure with age but remains visible longer than the longitudinal stripes. The black spots along the rows of scales are not present in the very young.

We preserved 91 specimens, ranging in length from 50 to 350 mm. It is the most common species of the genus on the Pacific coast of Panama and is of considerable commercial importance. It is the Pacific representative of *H. bonariense,* from which it may, however, be distinguished by the more deeply forked caudal, the more oblique rows of scales on sides, and by the round spots along the rows of scales which do not coalesce as in *H. bonariense.* The fins are also less densely scaled than in *H. bonariense.*

Known from Guaymas to Guayaquil. Our specimens were taken at Chame Point, Taboga Island, Naos Island, Balboa and Panama City.

396. Hæmulon sexfasciatum Gill.

Hæmulon sexfasciatus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 254 (Cape San Lucas).

Hæmulon maculosum Peters, Monatsb. k. Ak. Wiss. Berlin, 1869, 705 (Mazatlan).

Hæmulon sexfasciatum Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 288; Jordan & Evermann, Bull U. S. Nat. Mus., XLVII, 1898, 1294.

Head 2.65; depth 2.7; D. XII, 15; A. III, 9; scales 53.

Body elongate, compressed; the back elevated; anterior profile straight and oblique over snout and eyes, convex at nape; head deep; snout long, 2.15 in head; eye 6.2; mouth rather large, terminal, horizontal; maxillary reaching vertical from anterior margin of eye, 2.2 in head; teeth in the jaws in narrow villiform bands, the outer ones not enlarged; preopercle finely serrate; gill-rakers rather strong,

12 on lower limb of first arch; scales moderate, the series above lateral line quite oblique, 7 rows between the lateral line and the origin of the dorsal; pectoral fins with scales on base only, the other fins all densely scaled; dorsal fin long, deeply notched, the third spine the longest, a little shorter than the snout, the soft part highest anteriorly, with a convex margin; caudal fin very deeply emarginate; anal fin with 3 spines, the second enlarged, but failing to reach the tip of the third when deflexed, somewhat shorter than the longest dorsal spine; ventral fins inserted notably nearer origin of anal than tip of lower jaw; pectoral fins rather short, 1.65 in head.

Color grayish silvery; sides with 6 dark cross-bars which are notably wider than the interspaces; a few dark spots on head behind the eye; scales anteriorly above the lateral line with dark bases; fins pale dusky; axil of pectoral dark.

A single large specimen, 480 mm. in length, was obtained. This appears to be the first time the species was taken as far south as the coast of Panama. We have examined one of the type specimens, U. S. N. M. No. 3000, 97 mm. in length, from Cape San Lucas and another from the Tres Marias Islands on the west coast of Mexico, 185 mm. long. These specimens give the following measurements: Head 2.8 and 2.85; depth 2.5 and 2.85; eye 3.2 and 3.8 in head; snout 2.6 and 3.2; maxillary 2.55 and 2.65; D. XII, 15, and XII, 17; A. III, 9; scales 6-53 and 6-54. The color is essentially the same as in our large specimen, except that the cross-bars are somewhat more distinct. There is no trace of dark longitudinal stripes present in the type specimen, which indicates that they are probably never present.

Known from Guaymas to Panama. Our specimen was taken at Balboa.

152. Genus **Orthopristis** Girard.

Orthopristis Girard, Proc. Ac. Nat. Sci. Phila., 1859, 167 (type *Orthopristis duplex* Girard = *Perca chrysoptera* Linnæus).

Pristocantharus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 256 (type *Pristipoma cantharinum* Jenyns).

Isaciella Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 500 (type *Pristipoma brevipinne* Steindachner).

Evapristis Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 388 (type *Orthopristis lethopristis* Jordan & Fesler).

Body moderately elongate, compressed; the back more or less elevated; head rather deep; snout usually long; mouth small, low; teeth in the jaws in villiform bands, the outer ones usually somewhat en-

larged; preopercle usually finely serrate; gill-rakers rather long, slender; scales rather small, series above lateral line not parallel with it, small accessory scales present or wanting; dorsal and anal scaly or not; dorsal fin long, not deeply notched, the spines rather slender, the usual dorsal formula XII or XIII, 12 to 15; caudal fin not deeply forked, lunate; anal spines small, notably smaller than the dorsal spines. *Two species of this genus were taken, and both are from the Pacific coast.

KEY TO THE SPECIES.

a. Body deep, the depth 2.2 to 2.4 in length; dorsal fin normally with 12 spines and 14 or 15 soft rays; anal III, 10 or 11; dorsal and anal fins without scales. *chalceus*, p. 545.

aa. Body more slender, the depth 2.6 to 2.7 in length; dorsal fin normally with 13 spines and 16 or 17 soft rays; anal fin III, 12 or 13; dorsal and anal fins mostly covered with small scales. *brevipinnis*, p. 546.

397. Orthopristis chalceus (Günther).

Pristipoma chalceum Günther, Proc. Zoöl. Soc. London, 1864, 146 (Panama); Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 2 (Panama Bay).

Pristipoma kneri Steindachner (Sitzb. k. Ak. Wiss. Wien, LX) Ichth. Notizen, VIII, 1869, 3, Pl. II (Mazatlan).

Orthopristis chalceus Evermann & Jenkins, Proc. U. S. Nat. Mus., 1891, 149; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1337; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 110 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 117 (Perico Island; Panama).

Head 3 to 3.15; depth 2.2 to 2.4; D. XII (rarely XIII), 14 or 15; A. III, 10 or 11; scales in longitudinal series below lateral line 55 to 60.

Body rather deep, compressed; the back elevated; head deep; snout rather long, 2.5 to 3.05 in head; eye 3.6 to 4.1; mouth rather small, terminal, slightly oblique; maxillary scarcely reaching anterior margin of eye, 3 to 3.5 in head; teeth in the jaws in villiform bands, the outer ones slightly enlarged; preopercle finely serrate; gill-rakers rather short, 12 to 14 on lower limb of first arch; scales moderate, the series above lateral line not parallel with it, 8 or 8½ oblique rows between the lateral line and origin of dorsal; dorsal and anal fins scaleless, the caudal fin with minute scales; dorsal fin long, not deeply

*A third species, *O. scapularis* Fowler, not obtained by us, was recorded from Colon by Fowler (Proc. Ac. Nat. Sci. Phila., 1916, p. 402).

notched, the third spine usually the longest, equal to length of snout in adult, proportionately longer in young, the soft part with gently convex margin; caudal fin scarcely forked, but with deeply concave margin; anal fin with 3 spines, the second the strongest, but notably shorter than the longest dorsal spine, and not much longer than the eye, the soft portion with strongly convex margin; ventral fins inserted a little nearer origin of anal than tip of lower jaw; pectoral fins moderate, 1.05 to 1.2 in head.

Color brownish above, paler below; sides with irregular yellowish green lines, running upward and backward, becoming horizontal on caudal peduncle; pectorals pale, the other fins mostly blue black.

We preserved 40 specimens of this species, ranging in length from 160 to 275 mm. This is a common fish on the Pacific coast of Panama and is seen in the Panama City market daily. It is, therefore, a food fish of considerable importance. The young were not observed.

Known from the Gulf of California to Panama, the Galapagos Islands and the coast of Peru. Our specimens are from Chame Point, Balboa and Panama City.

398. Orthopristis brevipinnis (Steindachner).

Pristipoma (*Hæmulopsis*) *brevipinne* Steindachner, (Sitzb. k. Ak. Wiss. Wien, LX) Ichth. Notizen, VIII, 1869, 10, Pl. V (Mazatlan).

Isaciella brevipinnis Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 497; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1341.

Orthopristis brevipinnis Gilbert & Starks, Memoir. Cal. Ac. Sci., IV. 1904, 111, Pl. XV, fig. 30 (Panama Bay).

Head 3.3 to 3.4; depth 2.6 to 2.7; D. XIII, 16 or 17; A. III, 12 or 13; scales in longitudinal series below lateral line 60 to 62.

Body elongate, moderately compressed; anterior profile evenly convex; head rather deep; snout somewhat pointed, 3 to 3.2 in head; eye 4.2 to 4.3; mouth rather small, terminal, oblique; maxillary scarcely reaching anterior margin of eye, 3 to 3.2 in head; teeth in the jaws in narrow villiform bands, the outer ones in upper jaw slightly enlarged; preopercle serrate; gill-rakers short and slender, about 16 on lower limb of first arch; rows of scales above lateral line not parallel with it, 10 oblique series between the lateral line and origin of dorsal; many of the large scales with accessory scales at the bases; vertical fins with small scales; dorsal fin long, scarcely notched, the third spine the longest, equal to length of snout and eye, the soft part with nearly straight margin; caudal fin forked, both lobes acute; anal fin with 3

spines, the second and third of about equal length, not longer than eye; ventral fins inserted about equidistant from tip of lower jaw and origin of anal; pectoral fins moderately long, 1.05 to 1.15 in head.

Color grayish, with brownish gray stripes following the rows of scales.

Only 3 large specimens, ranging in length from 355 to 375 mm., were secured. This fish is apparently rare on the coast of Panama. We follow Gilbert & Starks in placing this species in the genus *Orthopristis*. We have examined the types, 2 specimens 175 and 190 mm. long, of *Microlepidotus inornatus* Gill (Proc. Ac. Nat. Sci. Phila., 1862, p. 256), which we consider doubtfully distinct from the present species. Our series, however, is too small and the size of the specimens is too unequal to admit of satisfactory comparison. The body in *inornatus* appears to be slightly more slender, the oblique rows of scales between the lateral line and origin of the dorsal one fewer in number and the lines along the rows of scales less distinct.

Known from Lower California south to Panama. Our specimens are from Balboa and Panama City.

153. Genus **Pomadasys** Lacépède.

Pomadasys Lacépède, Hist. Nat. Poiss., IV, 1803, 515 (type *Sciæna argentea* Forskål).

Body oblong, compressed; the back usually not much elevated; mouth rather small, terminal, protractile; the lips thin; the maxillary not reaching past middle of eye; teeth in jaws only, in villiform bands; the outer series in upper jaw often somewhat enlarged; a median groove behind the symphysis of the lower jaw; preopercle usually distinctly serrate, the serræ on the lower limb not directed forward; cheeks and opercles scaly; scales of moderate size, ctenoid; lateral line complete, arched; a single dorsal with XI to XIV, 11 to 15 rays, with a more or less distinct sheath of scales at base, soft portion without scales or with a row of small scales between the rays; anal with III, 6 to 8 rays.

KEY TO THE SPECIES.

a. Pectoral fin long, reaching to or past tip of ventrals, 1.05 to 1.6 in head; scales large, 3 to 4½ series between lateral line and middle of soft dorsal, 43 to 52 in a longitudinal series, above lateral line, from supraclavicle to base of caudal.

b. Mouth small, the maxillary usually not reaching anterior margin of eye; a row of small scales on the membrane between the soft rays of dorsal.

c. Caudal forked, the upper lobe notably the longer; pectorals of moderate length, not reaching vertical from vent; soft dorsal with 14 to 15 rays, rarely with only 13.

d. Head and body robust; the greatest width of head equal to length of snout and eye; eye small, about 4.2 in head in specimens 175 mm. long; interorbital and preorbital wide, notably wider than eye in specimens 175 mm. long; upper posterior margin of opercle never with black. *corvinæformis*, p. 549.

dd. Head and body more compressed; the greatest width of head equal to length of snout and about half of eye; eye larger, about 3.8 in head in specimens 175 mm. in length, interorbital and preorbital narrower, equal to or narrower than eye in specimens 175 mm. long; upper posterior margin of opercle usually jet black. *leuciscus*, p. 551.

cc. Caudal emarginate, the lobes of about equal length; pectorals very long, reaching to vertical from vent; soft dorsal with 13 rays. *macracanthus*, p. 552.

bb. Mouth moderate, the maxillary reaching to or past the anterior margin of eye; no small scales between the rays on soft dorsal.

e. Body robust; the mouth oblique, the gape wide; opercle with a conspicuous bluish black spot at upper posterior angle; pectoral fins very long, reaching vertical from origin of anal, 1.05 to 1.15 in head; anal III, 8. *panamensis*, p. 554.

ee. Body rather slender, compressed; the mouth nearly horizontal, the gape rather narrow; opercle without a black spot at its upper posterior angle; pectoral fins shorter, not reaching past vertical from vent, 1.2 to 1.4 in head; anal III, 7.

f. Body low, the back little elevated; the depth 2.8 to 3.2 in length; scales in 3 series between the lateral line and middle of soft dorsal, 47 to 50 in a longitudinal series above the lateral line from supraclavicle to base of caudal. *branickii*, p. 555.

ff. Body rather deep, the back rather strongly elevated, the depth 2.8 in length; scales in 4 series between lateral line and middle of soft dorsal, 51 or 52 in the longitudinal series. *approximans*, p. 556.

aa. Pectoral fins very short, not reaching tips of ventrals, 1.5 to 1.9 in head; scales small, 5 to 6½ series between lateral line and middle of soft dorsal, 57 to 70 in a longitudinal series above lateral line to base of caudal.

g. Mouth rather large, the maxillary reaching about anterior margin of pupil, 2.2 to 2.7 in head; scales small and in irregular series, difficult to enumerate, 6 or 6½ series between the lateral line and middle of soft dorsal, 60 to 70 in a longitudinal series, above lateral line, from supraclavicle to base of caudal.

bayanus, p. 557.

gg. Mouth somewhat smaller, the maxillary reaching to or slightly past anterior margin of eye, 2.5 to 2.8 in head; scales somewhat larger, the series more regular and less difficult to enumerate, 5 or 5½ series between the lateral line and middle of soft dorsal, 57 to 63 in the longitudinal series. *crocro,* p. 559.

399. Pomadasys corvinæformis (Steindachner). (Plate LV, fig. 1.)

Hæmulon corvinæforme Steindachner, (Sitz. k. Ak. Wiss. Wien, LVII) Ichth. Notizen, VII, 1868, 16 (Santos, Brazil).

Pomadasis corvinæformis Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 495.

Brachydeuterus corvinæformis Jordan & Rutter, Proc. Ac. Nat. Sci. Phila., 1897, 110; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1326; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 132 (Colon).

Pristipoma corvinæforme Metzelaar, Over Tropisch Atlantische Vischen, Amsterdam, 1919, 85 (Dutch West Indies).

Head 2.9 to 3.15; depth 2.7 to 3.15; D. XII, 13 to 15; A. III, 6 or 7; scales in 4½ series between lateral line and middle of soft dorsal, 49 to 52 in a longitudinal series, above lateral line, from supraclavicle to base of caudal.

Body elongate, robust; the back moderately elevated; anterior profile evenly convex; head short and robust, its greatest width equal to length of snout and eye; snout rather short and blunt, its length 2.55 to 3.2 in head; eye 3.2 to 4.6; mouth terminal, slightly oblique, rather small; the maxillary reaching anterior margin of eye, 3 to 3.25 in head; preopercle and supraclavicle serrate; preorbital wide, wider than the small eye, except in young less than 90 mm. in length; interorbital wide, notably wider than in *P. leuciscus;* scales of moderate size, ctenoid; lateral line arched, concurrent with the back; gill-rakers short, 10 to 12 more or less developed on lower limb of first arch; pseudobranchiæ well developed; stomach with six long pyloric appendages; air bladder anteriorly with three small appendages; dorsal spines rather short, the third usually the longest, 1.85 to 2.4 in

head; soft dorsal with a low sheath of scales at base, the rays rather low, a row of small scales on the membrane between the rays; caudal forked, the upper lobe constantly the longer; fin almost wholly covered with small scales; anal fin small, the second spine the strongest, but not reaching past the tip of the third, 2.1 to 3.4 in head; the soft rays longer than the spines, a row of small scales on the membrane between the rays; ventral fins small, the outer ray developed into a very short filament, not reaching vent; pectorals moderate, reaching somewhat past the tips of the ventrals, but not quite to vertical from vent.

Color grayish above, silvery below; young with about 5 indistinct vertical bars on sides, which become fainter and disappear with age; with or without a dark blotch at beginning of lateral line; each scale on sides with a dark blotch, forming more or less continuous longitudinal streaks along the rows of scales; cheeks with 2 more or less distinct dark streaks, running upward and backward; lower parts with or without dusky punctulations; fins usually all more or less dusky.

This species is represented by 23 specimens, ranging from 80 to 180 mm. in length, in our collection. Upon this series the above description is based. *P. corvinæformis* is very close to *P. leuciscus,* especially to that form of *leuciscus* that has been described as *nitidus,* from which it can scarcely be separated. It, however, has a somewhat more robust body, a wider and heavier head and snout; the anterior profile is more evenly and strongly convex. The eye is smaller, the preorbital and interorbital wider. Comparing specimens 175 mm. in length, in *P. corvinæformis* the eye is contained about 4.2 times in head, in *P. leuciscus* only about 3.8 times. The preorbital and interorbital in the former, using specimens of the same size as above, are notably wider than the eye; in the latter they are equal to or narrower than eye. The lines along the rows of scales on sides in *corvinæformis* are more distinct than in any specimen of *leuciscus* seen by us. The former never has black on the margin of the opercle above the posterior angle, which is very evident in many specimens of *leuciscus.* Our series of *corvinæformis* does not present the wide and bewildering variations found in *leuciscus.*

Known from the Atlantic coast from the West Indies south to Brazil. Our specimens are from Toro Point; Fox Bay, Colon; Colon Reef; Colon Market, and Porto Bello.

400. Pomadasys leuciscus (Günther). (Plate LV, fig. 2.)

Pristipoma leuciscus Günther, Proc. Zoöl. Soc. London, 1864, 147 (San José and Chiapam), and Trans. Zoöl. Soc. London, VI, 1869, 416, Pl. LXVI, fig. 3; Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 2.

Pristipoma (Hæmulopsis) nitidum Steindachner, (Sitz. k. Ak. Wiss. Wien, LX) Ichth. Notizen, VIII, 1869, 5, Pl. III (Mazatlan).

Pomadasys leuciscus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 387.

Pomadasys elongatus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 352 (Mazatlan; Panama).

Pomadasis nitidus Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 494.

Pomadasis leuciscus Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 495; Regan, Biol. Cent. Amer., Pisc., 1907, 42.

Brachydeuterus nitidus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1326; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 109.

Brachydeuterus leuciscus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1327; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 109.

Head 2.7 to 3.3; depth 2.8 to 3.2; D. XII, 13 to 15; A. III, 7 or 8; scales in 4½ or 5 series between the lateral line and middle of second dorsal, 49 to 52 in a horizontal series, above the lateral line, from supraclavicle to base of caudal.

Body elongate, compressed; the back moderately elevated; anterior profile usually almost straight, but sometimes notably convex; head variable in shape, usually long and low, but sometimes rather short and swollen over eyes, its greatest width usually equal to length of snout and half of eye; snout variable, long and pointed or rather short and blunt, its length 2.3 to 3.3 in head; eye 3.1 to 5.35; mouth terminal, nearly horizontal, variable in size, maxillary usually not reaching anterior margin of eye, 2.8 to 3.35 in head; preopercle and supraclavicle serrate, the serræ becoming blunter with age; preorbital entire, varying greatly with age, not much more than half the width of the eye in specimens about 50 mm. long; one and one-half times the width of the eye in specimens 300 mm. long; scales moderate, ctenoid; lateral line arched, concurrent with the back; gill-rakers short, 8 to 11 more or less developed on the lower limb of the first arch; pseudobranchiæ large; stomach with 5 or 6 very long pyloric appendages; air bladder anteriorly with three very short and

slender appendages; dorsal spines moderate, the third usually the longest, 1.8 to 2.8 in head; soft dorsal with a very low sheath of scales at base, the rays rather low, a row of small scales on the membrane between the rays; caudal forked, the upper lobe always notably the longer, the fin covered with small scales; anal small, the second spine the strongest, variable in size, but not reaching past tip of the third, 2.1 to 4 in head; the membrane between the soft rays with or without a row of small scales; ventral fins small, the outer ray developed into a short filament, not reaching vent; pectorals rather short, reaching slightly past the tips of the short ventrals, 1.2 to 1.6 in head.

Color grayish above, silvery below; sides with or without indistinct cross-bars; some individuals with a rather wide, pale lateral band, extending from upper posterior angle of opercle to base of caudal; scales on sides with or without a dark base, sometimes forming rather distinct dark lines along the rows of scales; belly with or without dusky punctulations; some specimens with a distinct black blotch, about as large as the eye, at the beginning of the lateral line, this faint or wanting in others; margin of opercle from upper anterior angle to posterior angle often with a prominent jet black band, this very narrow or missing in others; fins all more or less dusky; axil black.

Our collection contains 139 specimens of this species, ranging in length from 60 to 370 mm. Besides these we have examined numerous specimens in the U. S. National Museum collection from other points of the Central American coast. It is a most unusually variable species. This accounts for the fact that it has by some writers been separated into three forms, *leuciscus, nitidus* and *elongatus*. Our large series, however, shows that the three forms completely intergrade. It is also close to *P. axillaris,* which is not known from Panama, from which all our specimens, however, differ in the notably shorter pectoral fins.

Known from the Pacific coast of tropical America, from Lower California south to Capan, Peru. Our specimens are from Chame Point; Taboga Island; Panama Bay, Balboa, and the Panama City market.

401. Pomadasys macracanthus (Günther).

Pristipoma macracanthum Günther, Proc. Zoöl. Soc. London, 1864, 146 (Chiapam, Guatemala), and Trans. Zoöl. Soc. London, VI, 1869, 416, Pl. LXIV, fig. 1.

Pomadasis macracanthus Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 493; Jordan & Evermann, Bull. U. S. Nat.

Mus., XLVII, 1898, 1332; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 110; Regan, Biol. Cent. Amer., Pisc., 1907, 42.

Head 2.5 to 2.8; depth 2.55 to 2.8; D. XII, rarely only XI, 13; A. III, 7 or 8; scales in 3½ to 4 rows between the lateral line and middle of soft dorsal, 43 to 50 in a longitudinal series, above lateral line, from supraclavicle serræ to base of caudal.

Body deep, much compressed; the back much elevated; anterior profile straight, or slightly concave over eyes; head long, compressed; snout long and pointed, its length 2.2 to 2.9 in head; eye 3.6 to 5.6; mouth terminal, horizontal, small; the maxillary not reaching anterior margin of eye, 3.1 to 3.5 in head; preopercle and supraclavicle finely serrate in young, becoming smoother with age; preorbital smooth, narrower than eye in young, but much wider than the eye in adult; scales large, rather weakly ctenoid, at least in adult; lateral line arched, concurrent with the back; gill-rakers short and weak in young, very short and blunt in adult, 10 to 13 more or less developed on the lower limb of the first arch; pseudobranchiæ present; stomach with 6 long pyloric appendages, these about half the total length of the stomach; air bladder very large, with 2 lateral appendages anteriorly; dorsal spines strong, the fourth usually the longest, 1.6 to 2.7 in head; soft dorsal short, with scaly sheath at base, and with a row of small scales on the membrane between the rays; caudal slightly emarginate, mostly covered with small scales; anal fin with a sheath of scales at base and with small scales on the fin between the rays; the second spine much enlarged, reaching past tips of longest anal rays when deflexed in young, proportionately shorter in adult and not reaching tips of longest rays when deflexed, 1.5 to 2.5 in head; ventrals moderate, the outer ray produced in a short filament, scarcely reaching vent in young, proportionately shorter in adult; pectorals very long, reaching past tips of ventrals to vertical from vent, 1.15 to 1.3 in head.

Color variable, from dark brassy brown to grayish above, brownish or silvery below; back and sides usually with about 4 dark bars, these sometimes very indistinct or wanting; sides often with brownish or dusky punctulations; fins mostly pale on the lighter colored specimens and dark brown or dusky on the darker colored specimens.

This species is here described from specimens ranging in length from 110 to 324 mm. Our collection contains 9 large examples.

Known from the Pacific coast of tropical America from Mazatlan south to Ecuador. Our specimens are from a tide stream and from Panama Bay at Balboa.

402. Pomadasys panamensis (Steindachner).

Pristipoma panamense Steindachner, (Sitz. k. Ak. Wiss. Wien, LXXII) Ichth. Beitrage, III, 1875, 8 (Panama).

Pomadasis panamensis Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 494; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1331; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 109.

Head 2.65 to 2.8; depth 2.5 to 2.7; D. XII, 12, rarely 13; A. III, 8; scales in 3½ or 4 rows between the lateral line and soft dorsal, 46 to 50 in a longitudinal series, above the lateral line, from supraclavicle to base of caudal.

Body rather deep, compressed; anterior profile evenly convex; dorsal outline only slightly more curved than the ventral; head rather short, robust; the snout short and wide, its length 2.9 to 3.35 in head; eye 3.3 to 4.4; mouth terminal, large, oblique, the gape wide; maxillary reaching about to anterior margin of pupil, 2.5 to 2.9 in head; preopercle finely serrate, the serræ becoming shorter with age; supraclavicle without bony serræ; preorbital entire, somewhat narrower than eye in young, but notably wider than eye in adult; scales large, ctenoid; lateral line rather low, little arched, not closely concurrent with the back; gill-rakers moderate, 12 to 14 on the lower limb of the anterior arch; pseudobranchiæ large; stomach with 6 long pyloric appendages; air bladder large, anteriorly with 2 very short horns; dorsal and anal with a very low and indistinct sheath of scales at base; dorsal spines weaker than in the other species of this genus, the third one the longest, 1.5 to 1.95 in head; soft dorsal rather low, the posterior rays not much shorter than the anterior, no scales on membrane of fin; caudal emarginate, covered with small scales, at least at base; anal fin without scales, the second spine enlarged, but not as much so as in other species of this genus, not reaching tips of longest rays when deflexed, 1.9 to 2.3 in head; ventrals moderate, the outer ray produced in a short filament, not reaching vent; pectorals very long, reaching past vent to vertical from origin of anal, 1.05 to 1.15 in head.

Color grayish above, silvery below; the young with indistinct blackish bars, one of these often appearing as a blackish blotch between the lateral line and middle of spinous dorsal in larger individuals; a distinct black spot just above the upper posterior angle on opercle; anterior to this spot is a greenish area; the lower fins usually pale; other fins with more or less dusky; soft dorsal and upper lobe of caudal with a black margin.

Of this species 11 specimens, 130 to 220 mm. in length, were preserved, and upon these the above description is based.

Known from Guaymas, Mexico, south to Panama. Our specimens are from Panama Bay, Balboa and the Panama City market.

403. Pomadasys branickii (Steindachner).

Pristipoma branickii Steindachner, Denkschr. k. Ak. Wiss. Wien, XLI, 1879, 28, Pl. IX, fig. 1 (Tumbez, Peru).

Pomadasis branicki Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 493; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1333; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 110; Regan, Biol. Cent. Amer., Pisc., 1907, 43.

Head 2.8 to 3; depth 2.8 to 3.2; D. XIII, 11 or 12; A. III, 7; scales in three series between lateral line and middle of soft dorsal, 47 to 50 in a longitudinal series, above lateral line, from supraclavicle serræ to base of caudal.

Body compressed; the back moderately elevated; anterior profile rather steep, straight over eyes: ventral outline from snout to origin of anal but slightly curved; head compressed; the snout rather short and blunt, shorter than the large eye in young, equal to or longer than eye in larger specimens, 3 to 3.3 in head; eye 2.6 to 3.2; mouth nearly horizontal, small; the maxillary reaching about vertical from anterior margin of orbit, 3.3 to 3.7 in head; preopercle and supraclavicle serrate; preorbital entire, rather narrow, not more than half the width of the eye in the young, proportionately wider in adult; scales ctenoid, large and in regular series; lateral line arched; following the curve of the back; gill-rakers short and feeble, 8 or 9, exclusive of rudiments, on lower limb of first arch; pseudobranchiæ well developed; dorsal spines strong; moderately elevated, the fourth usually the longest, 1.5 to 2 in head; soft dorsal with a rather distinct sheath of scales at base, composed of one row of scales, no scales on membrane of fin, the rays rather low, decreasing in length posteriorly, outer margin of fin convex; caudal emarginate, scaly at base; anal with a scaly sheath at base, the spines moderate, the second enlarged, much longer and stronger than the third, variable, reaching to or past the tips of the longest rays when deflexed, 1.15 to 1.75 in head; ventrals moderate, outer ray produced in a short filament, not quite reaching vent; pectorals long, reaching to or past the tips of ventrals, 1.2 to 1.35 in head.

Color bluish black above with silvery reflections; sides with dusky punctulations; silvery below; our small specimens with indistinct

longitudinal streaks and blotches; fins all more or less dusky; dorsal and caudal with a black margin; soft dorsal with an indistinct blackish bar or a row of spots at base.

Our collection contains 5 small specimens, ranging from 70 to 90 mm. in length. We also examined 7 specimens, 140 to 155 mm. long, from Mazatlan, Mexico. Upon these two lots the above description is based. This species differs notably from *P. bayanus* in the larger eye, larger scales and in the much longer pectoral.

Known from the Pacific coast of tropical America from Mazatlan, Mexico, south to Tumbez, Peru. Our specimens are from Chame Point and Taboga Island.

404. Pomadasys approximans Bean & Dresel.

Pomadasys approximans Bean & Dresel, Proc. U. S. Nat. Mus., 1885, 160 (Jamaica).

Pomadasis crocro Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1333 (in part).

Head 2.7 to 2.95; depth 2.8 to 2.85; D. XIII, 11 or 12; A. III, 7; scales 4 between lateral line and middle of soft dorsal, exclusive of small scales on base of fin, 51 to 52 in a longitudinal series, above the lateral line, from supraclavicle serræ to base of caudal.

Body deep, the depth about equal to length of head; the back notably elevated; anterior profile nearly straight, rather steep; ventral outline from tip of lower jaw to origin of anal nearly straight; snout moderate, its length 3 to 3.6 in head; eye 2.8 to 3.2; mouth horizontal, rather small; the maxillary reaching to about vertical from anterior margin of eye, 3 to 3.2 in head; preopercle and supraclavicle serrate; preorbital entire, notably narrower than the very large eye; scales ctenoid, in regular series, larger than in related species; lateral line arched, following the curvature of dorsal outline; gill-rakers very short and feeble, 8 or 9, exclusive of rudiments, on lower limb of anterior arch; pseudobranchiæ well developed; dorsal spines moderately elevated, the fourth the longest, 1.8 in head; soft portion of dorsal with about 2 rows of small scales at base, but without a distinct sheath, no scales on the membrane of the fin, the rays rather low, decreasing in length posteriorly, outer margin of fin convex; caudal emarginate, scaly at base; anal with a distinct sheath of scales at base, the spines strong, the second much enlarged, reaching to or past the tips of the longest soft rays when deflexed, 1.45 to 1.5 in head; ventrals moderate, the outer ray with a short filament, reach-

ing vent in very young, shorter in adult; pectorals long, reaching to or slightly past the tips of ventrals, 1.2 to 1.4 in head.

Color olivaceous above, silvery below; our small specimen with three rather distinct longitudinal streaks, one above and two below the lateral line. Besides these it has several black blotches on side, and a blackish bar at base of caudal; fins all more or less dusky.

This species is here redescribed from the type specimen, 180 mm. long, from Jamaica, and from 2 very small specimens, each about 60 mm. long, from Porto Bello, which are the only specimens of this species taken by us in Panama. This species differs from *P. crocro*, with which it has been confused, in the deeper body, in the much larger eye, smaller mouth, longer pectoral fins, and in the somewhat larger scales. Its nearest relative is *P. branickii* from the Pacific coast, from which it can scarcely be separated. It, however, seems to differ somewhat in the slightly deeper body, with a more strongly elevated back, and in the somewhat more numerous scales.

Known only from the specimens here described, the type from Jamaica, and our 2 small specimens from Porto Bello, Panama.

405. Pomadasys bayanus Jordan & Evermann.

Pristipoma humile Kner & Steindachner, Sitz. k. Ak. Wiss. Münch., II, 1863, 221 (Rio Bayano, Panama; not *Pristipoma humilis* Bowdich, Fishes of Madeira, 1825, 236); Steindachner, Denkschr. k. Ak. Wiss. Wien, XLI, 1879, 33.

Pomadasis humilis Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 492.

Pomadasis bayanus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1331; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 109; Regan, Biol. Cent. Amer., Pisc., 1907, 43.

Pristipoma labraciforme Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 335, 1899, 3 (Sta. Elena Bay, Ecuador).

Head 2.65 to 3.3; depth 3.15 to 3.9; D. XIII, 12; A. III, 7; scales 6 or 6½ between lateral line and middle of rayed portion of dorsal, 60 to 70 in longitudinal series, above lateral line, from supraclavicle serræ to base of caudal.

Body elongate, moderately compressed; the back elevated; anterior profile straight over eyes in young, slightly concave in adult; head rather long; snout blunt, its length 2.4 to 3.2 in head; eye 3.5 to 5.4; mouth rather large, nearly horizontal, lower jaw included; the maxillary reaching about to anterior margin of pupil, 2.2 to 2.7 in head; preopercle and supraclavicle serrate; preorbital entire, as

wide as eye in adult, narrower in young; scales rather small, ctenoid, in irregular series, making them difficult to enumerate; lateral line arched, closely following the curvature of the dorsal outline; gill-rakers short and blunt, 7 to 9, exclusive of rudiments, on lower limb of anterior arch; pseudobranchiæ well developed; stomach with 7 long slender pyloric appendages; air bladder large, without appendages; dorsal spines strong, rather low, the fourth usually the longest, 2 to 3 in head; soft portion without a distinct sheath of scales at base, no scales on membrane of fin, the anterior rays moderately elevated, decreasing in length posteriorly; caudal fin emarginate, scaly at base; anal fin with a more or less distinct sheath of scales at base; the spines very strong, the second much enlarged, much stronger than the third, also longer, varying greatly with age, reaching past the tips of longest soft rays and to or almost to base of caudal when deflexed in young, not reaching the tips of soft rays and not nearly to base of caudal in adult, 1.4 to 2.6 in head; ventrals rather short, outer ray with a short filament, not reaching vent except in very young; pectorals very short, not reaching tips of ventrals, 1.5 to 1.9 in head.

Color dark olivaceous above, silvery below; the young with more or less indistinct wavy streaks along sides; fins all more or less dusky; dorsal with a narrow black margin.

This species is here described from 26 specimens, ranging from 110 to 360 mm. in length. It is very close to *P. crocro,* from the Atlantic, from which it differs somewhat in having smaller and more irregular series of scales. In a series of 15 there are 6 or 6½ scales between the lateral line and the middle of soft dorsal (not including small scales on base of fin) and in the longitudinal series from supraclavicle serræ to base of caudal there are from 60 to 70, with an average of 65 scales to a series. *P. crocro* has 5 or 5½ scales between the lateral line and the middle of the soft dorsal, and 57 to 63 in the longitudinal series, with an average of 59.6 scales to a series. The Pacific coast species also has a slightly larger mouth, and a somewhat more slender body; the average depth in length of a series of 15 specimens is 3.46. The average depth in length of a series of 15 specimens of about equal size of *P. crocro* is 3.28.

Known from Lower California south to Ecuador. Our specimens are all from fresh water, viz.: Rio Chame, Chame; Rio Chorrera, small creek, Chorrera; Rio Grande, Corozal; Rio Marte Arnade, Rio Juan Diaz, Juan Diaz; Rio Mamone, El Capitan, and Rio Mamone, Chepo.

406. Pomadasys crocro (Cuvier & Valenciennes).

Pristipoma crocro Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 264 (Martinique).

Pristipoma cultriferum Poey, Memorias, II, 1860, 185 (Havana).

Pristipoma ramosum Poey, Memorias, II, 1860, 186 (Havana).

Pristipoma productum Poey, Memorias, II, 1860, 186 (Havana).

Pristipoma boucardi Steindachner, (Sitz. k. Ak. Wiss. Wien, LX) Ichth. Notizen, VIII, 1869, 1, Pl. I (Gulf of Mexico).

Pomadasis crocro Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 493; Jordan & Evermann, Bull. U. S. Nat Mus., XLVII, 1898, 1333; Regan, Biol. Cent. Amer., Pisc., 1907, 44.

Pomadasis ramosus Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 494; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1334; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 402 (Colon).

Pomadasis productus Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 493; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1332.

Pomadasys starri Meek, Field Col. Mus. Pub., Zoöl. Ser., V, 1904, 200, Pl. XIII (Perez, Mexico).

Pomadasys templei Meek, Field Col. Mus. Pub., Zoöl. Ser., V, 1904, 201, Pl. XIV (Valles, San Luis Potosi, Mexico).

Pomadasis boucardi Regan, Biol. Cent. Amer., Pisc., 1907, 43.

Pomadasis grandis Meek, Field Col. Mus. Pub., Zoöl. Ser., VII, 1907, 116 (Lake Nicaragua).

Head 2.95 to 3.2; depth 3.1 to 3.5; D. XIII, 11 to 13; A. III, 7; scales in 5 or 5½ series between the lateral line and middle of soft dorsal, 57 to 63 in a longitudinal series, above lateral line, from supraclavicle serræ to base of caudal.

Body elongate, compressed; the back moderately elevated; anterior profile straight over eyes in young, slightly convex in adult; head rather long; snout blunt, its length 2.65 to 3.15 in head; eye 3.3 to 5.5; mouth moderate, horizontal, lower jaw included; the maxillary reaching to or slightly past anterior margin of eye, 2.5 to 2.8 in head; preopercle and supraclavicle serrate; preorbital entire, as wide as eye in adult, but notably narrower in young; scales moderate, ctenoid, in more regular series and easier to enumerate than in *P. bayanus;* lateral line arched, following the curvature of the dorsal outline; gill-rakers short and blunt, 7 to 9, exclusive of rudiments, on lower limb of anterior arch; pseudobranchiæ well developed; stomach with six pyloric appendages; air bladder large, without

appendages; dorsal spines strong, rather low, the fourth usually the longest, 1.8 to 2.25 in head; soft portion of dorsal without a distinct sheath of scales at base, no scales on membrane of fin, outer margin of soft dorsal straight; caudal emarginate, basal two-thirds of fin more or less scaly; anal fin with a rather distinct sheath of scales at base, the spines very strong, the second much enlarged, much longer and stronger than the third, varying greatly with age and among individuals, reaching to or past the tips of the longest soft rays and often nearly to base of caudal when deflexed in specimens ranging from about 75 to 175 mm. in length, not reaching tips of longest soft rays and not nearly to base of caudal in the adult and in very young individuals, 1.25 to 1.8 in head; ventral fins rather short, outer ray with a short filament, not reaching vent, except in very young; pectorals short, not reaching tips of ventrals, 1.5 to 1.7 in head.

Color dark olivaceous above, silvery below; sides often with dusky punctulations; the young often with indistinct longitudinal streaks, which become fainter and disappear with age; fins all more or less dusky; soft dorsal with a narrow black margin.

Of this species 87 specimens, ranging in length from 60 to 325 mm., were preserved and form the basis for the above description. We have also examined numerous specimens from the West Indies (some of these were of Poey's own identification) and from the Central American coast, and have found that due to an inadequate amount of material several species were described which represent mere variations within this species. We have, therefore, included several of these described forms.

Known from the Atlantic coast of tropical America, from the West Indies south to Brazil; ascending rivers. Several of our specimens were taken in the Upper Chagres and the Boqueron, more than 100 miles, following the course of the rivers, from the sea, and above many rapids. Our specimens are from Toro Point; Rio Chagres at Gatun; Gorgona and Alhajuela; Upper Chagres; Rio Boqueron; Upper Trinidad; Mindi Cut, Creek at Mindi; Porto Bello, and Rio Cascajal near Porto Bello.

154. Genus **Anisotremus** Gill.

Anisotremus Gill, Proc. Ac. Nat. Sci. Phila., 1861, 32, 105 (type *Pristipoma rodo* Cuvier & Valenciennes=*Sparus virginicus* Linnæus).

Genytremus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 256 (type *Pristipoma bilineatum* Cuvier & Valenciennes).

Body rather deep, compressed; the back elevated; head moderate; snout rather short; mouth small, placed low, usually nearly horizontal; lips thick; maxillary rarely reaching much beyond anterior margin of eye; teeth in the jaws in bands, conical or pointed, the outer series usually somewhat enlarged; chin with a median groove besides small pores; scales large, ctenoid; dorsal spines long, not graduated, the third or fourth spine longest; anal spines strong, the second enlarged; soft dorsal and anal with many small scales on interradial membranes; caudal fin mostly covered with scales, forked or at least broadly concave; inside of mouth not red.

KEY TO THE SPECIES.

a. Longitudinal rows of scales above lateral line parallel with it.

b. Pectoral fins long, reaching to or beyond origin of anal, 2.9 in body; body with a single indistinct dark bar extending from nape to base of ventrals. *cæsius*, p. 562.

bb. Pectoral fins shorter, failing to reach opposite origin of anal; sides with about 5 dark cross-bars.

c. Caudal fin rather deeply forked; soft fins with many small scales; outline of soft dorsal nearly straight; 8 or 9 rows of scales between the lateral line and base of first dorsal spine. *dovii*, p. 563.

cc. Caudal fin scarcely forked; soft fins with rather few scales; outline of soft dorsal convex; 6½ rows of scales between the lateral line and base of first dorsal spine. *pacifici*, p. 564.

aa. Longitudinal rows of scales above lateral line not parallel with it.

d. Scales anteriorly above lateral line not especially enlarged; sides with pale longitudinal stripes; a prominent caudal spot present at all ages. *bicolor*, p. 565.

dd. Scales anteriorly above lateral line notably enlarged; sides plain in adult; young with 2 black stripes and a caudal spot, disappearing with age.

e. Scales above lateral line in 4 to 7 rows; color dark brown, each scale on sides and back with a dark base.

f. Scales anteriorly above lateral line moderately enlarged, 6 or 7 rows between the lateral line and the base of first dorsal spine; outline of the soft dorsal concave; color rather dark brown, the dark bases of the scales moderately distinct. *surinamensis*, p. 566.

ff. Scales anteriorly above lateral line greatly enlarged, 4 or 5 rows between the lateral line and the base of the first dorsal spine; outline of soft dorsal straight or convex; color pale brown, the dark bases on the scales large and very prominent. *interruptus*, p. 567.

ee. Scales above lateral line smaller, in 10 or 11 rows; color greenish yellow or golden yellow, back and sides with yellowish or bronze longitudinal stripes, the scales without dark bases.

g. Anterior profile very steep, gently convex from snout to nape, from thence to dorsal strongly convex; interradial membranes of the vertical fins densely scaled; color greenish brown, the back and sides with alternating bluish and bronze stripes. *virginicus*, p. 568.

gg. Anterior profile moderately steep, gently convex over eyes and snout, strongly convex at nape; the interradial membranes of the vertical fins less densely scaled; color golden yellow, sides with blue streaks edged with black. *tæniatus*, p. 570.

407. Anisotremus cæsius (Jordan & Gilbert).

Pomadasys cæsius Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 383 (Mazatlan).

Anisotremus cæsius Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 484 (Mazatlan; Acapulco); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1316; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 107 (Panama Bay).

Head 3. to 3.15; depth 2.05 to 2.2; D. XII, 15 or 16; A. III, 9 or 10; scales 50 to 54.

Body rather deep, compressed; anterior profile quite steep, gently convex over snout, nearly straight over eyes, strongly convex at nape; head moderate; snout short, its length 2.8 to 3 in head; eye 2.95 to 3.65; mouth small, terminal, slightly oblique; maxillary reaching to or slightly past anterior margin of eye, 2.9 to 3.2 in head; teeth all small, in villiform bands, the outer ones not noticeably enlarged; preopercle finely serrate; gill-rakers short, 13 more or less developed on lower limb of first arch; scales moderate, ctenoid, not enlarged anteriorly above lateral line, the series parallel with it, 7 rows between the lateral line and origin of dorsal; 15 or 16 rows between the lateral line and origin of anal; dorsal fin long, the spines strong, the fourth the longest, slightly exceeding the length of the snout and half the eye, the soft part low, highest anteriorly; small scales present on interradial membranes; caudal fin forked, the upper lobe the longer,

pointed, the lower lobe without acute angle at outer rays, the fin mostly covered with small scales; anal fin with 3 spines, the second enlarged, reaching tips of soft rays when deflexed, equal to or slightly longer than the longest dorsal ray, the soft portion of the anal short, the anterior rays the longest; ventral fins moderate, notably shorter than pectorals, inserted about equidistant from tip of the lower jaw and origin of anal; pectoral fins long, reaching to or beyond origin of anal, 2.9 in body.

Color dark grayish brown, with more or less silvery on the lower parts; each scale with a brownish margin; upper parts of head and snout dark; margin of opercle dusky; an indistinct dark bar from nape to base of ventral; fins mostly dusky, the ventrals nearly black.

Only 2 specimens of this species were obtained, measuring respectively 183 and 233 mm. in length. It was, therefore, not found abundant as reported by Gilbert & Starks.

Known from Mazatlan to Panama. Our specimens were purchased in the Panama City market.

408. Anisotremus dovii (Günther). (Plate LVI.)

Pristipoma dovii Günther, Proc. Zoöl. Soc. London, 1864, 23, Pl. III, fig. 1 (Panama); Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 2 (Panama Bay).

Pomadasys dovii Jordan & Gilbert, Proc. U. S. Nat Mus., 1881, 386.

Anisotremus dovii Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 484; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1317; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 107 (Panama Bay).

Head 2.9 to 3; depth 2 to 2.2; D. XI, 13 to 15; A. III, 9 or 10; scales 47 to 51.

Body deep, compressed; anterior profile rather steep, nearly straight over the head, strongly convex in front of dorsal; head moderate; snout short, 2.9 to 3.4 in head; eye 3 to 3.4; mouth small, terminal, low, slightly oblique; maxillary scarcely reaching anterior margin of eye, 3 to 3.4 in head; teeth in the jaws in bands, conical, the outer ones slightly enlarged; preopercle finely serrate; gill-rakers short, 12 to 14 on the lower limb of the first arch; scales strongly ctenoid, reduced on head, the series above lateral line parallel with it, 8 or 9 rows of scales between the lateral line and the origin of the dorsal, 12 or 13 rows between the lateral line and the origin of the anal; dorsal fin long, the spines very strong, the third or fourth the longest, slightly exceeding the length of eye and snout, the soft part highest anteriorly,

the interradial membranes densely scaled; caudal fin forked, the upper lobe the longer, fin covered with small scales; anal fin with 3 spines, the second enlarged, reaching nearly or quite to tips of soft rays when deflexed, of about the same length as the longest dorsal spine, the soft portion short, scaly, highest anteriorly; ventral fins moderate, the outer rays slightly filamentous, inserted slightly nearer origin of anal than tip of lower jaw; pectoral fins moderate, shorter than head, failing to reach opposite origin of anal, 3.5 to 3.75 in body.

Color brownish above, sides silvery with bluish reflections; 5 black cross-bars present, one passing through eye, one from nape to chest, another under middle of spinous dorsal, the fourth under anterior part of soft dorsal, the fifth on caudal peduncle; spinous dorsal green, the other fins pale with little blue; iris yellow.

The present collection contains 17 specimens, ranging in length from 40 to 400 mm. This species is frequently seen in the market and is of value as food.

Known from Mazatlan to Panama. Our specimens are from Chame Point, Balboa and Panama City.

409. Anisotremus pacifici (Günther). (Plate LVII.)

Conodon pacifici Günther, Proc. Zoöl. Soc. London, 1864, 147 (Chiapam, Guatemala).

Pomadasys pacifici Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 385 (Panama).

Anisotremus pacifici Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 484; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1316; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 106 (Panama Bay).

Head 3.1 to 3.3; depth 2 to 2.4; D. XI, 14; A. III, 9 or 10; scales 45 to 47.

Body deep, compressed; anterior profile convex over snout, straight over eyes, strongly convex at nape; head moderate; snout blunt, 3.4 to 3.9 in head; eye 3.2 to 3.7; mouth rather small, low, terminal, slightly oblique; maxillary reaching past anterior margin of eye, or nearly to middle of eye in adult, 3 to 3.35 in head; teeth in the jaws in bands, conical or pointed, the outer ones enlarged; preopercle serrate; gill-rakers short, 11 to 13 more or less developed on the lower limb of the first arch; scales strongly ctenoid, reduced on head, not enlarged above lateral line, the series parallel with it, 6½ rows between the lateral line and origin of dorsal, 13 or 14 between the lateral line and origin of anal; dorsal fin long, the spines high and strong, the fourth

the longest, equal to or exceeding length of eye and snout, the soft part highest in the middle, the interradial membranes with a row of small scales on lower half of fin; caudal fin with concave margin, scarcely forked, the upper rays the longest, most of the fin with small scales; anal fin with 3 spines, the second enlarged, failing to reach the tips of the soft rays when deflexed, a little longer than the longest dorsal spine, the soft portion short, highest anteriorly, scales present only on lower part of interradial membranes; ventral fins moderate, the outer rays with a short filament, inserted slightly nearer origin of anal than tip of lower jaw; pectoral fins shorter than head, failing notably to reach opposite origin of anal, 3.8 to 4.3 in body.

Color dark grayish; scales on sides with a bluish luster; 5 dark bands present, similar in position to those of *A. dovii,* these often very obscure, or the posterior ones wanting in dark colored specimens; lower parts with dusky points; pectorals and caudal pale or dusky, the other fins dark brown or black.

The present collection contains 12 specimens of this species, ranging in length from 140 to 205 mm. It is occasionally seen in the market and is of some value as food. It is closely related to *A. dovii,* from which it may, however, be distinguished by the slightly larger scales, there being only 6½ rows between the lateral line and the origin of the dorsal in the present species and 8 or 9 in *A. dovii.* The caudal fin in *A. pacifici* is less deeply concave, there are fewer scales on the vertical fins, the snout is slightly shorter, the maxillary longer, and the color is notably darker.

Known from Chiapam to Guayaquil. Our specimens are from Chame Point, Corozal, Balboa and Panama City.

410. Anisotremus bicolor (Castelnau).

Pristipoma bicolor Castelnau, Anim. Nouv. Rares Amér. Sud, 1855, 8, Pl. II, fig. 2 (Bahia, Brazil).

Pristipoma brasiliense Steindachner, Verh. Zool. — Bot. Ges. Wien, XIII, 1863, 1013 (Bahia).

Anisotremus bicolor Jordan, Proc. U. S. Nat. Mus., 1890, 319; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1319.

Head 2.85 to 3.05; depth 1.96 to 2.2; D. XII (rarely XIII), 15 to 17; A. III, 8 or 9; scales 47 to 54.

Body rather deep, compressed; anterior profile convex over snout and at nape, nearly straight over eyes; head moderate; snout rather blunt, its length 2.85 to 3.3 in head; eye 3 to 3.4; mouth small, terminal, slightly oblique; maxillary reaching to or slightly past anterior margin

of eye, 3 to 3.45 in head; teeth in the jaws in villiform bands, the outer ones slightly enlarged; preopercle finely serrate; gill-rakers short, 13 to 15 on lower limb of first arch; scales moderate, not enlarged above lateral line, and the series not parallel with it, 7 series between lateral line and origin of dorsal, 12 or 13 series between lateral line and origin of anal; the soft fins all more or less scaly; dorsal fin long, the spines strong, the fourth the longest, not quite equal to length of eye and snout, the anterior rays of the soft dorsal higher than the posterior ones; caudal fin moderately forked, the lobes scarcely pointed; anal fin with 3 spines, the second one enlarged, equal in length to longest dorsal spine, but notably stronger, the soft portion similar in shape to that of the dorsal; ventral fins moderate, a little shorter than the pectorals, inserted a little nearer origin of the anal than tip of lower jaw; pectoral fins slightly falcate, shorter than head, 3.2 to 3.5 in body.

Color in alcohol dark brown; sides with 6 or 7 narrow pale longitudinal stripes; opercular flap black; a more or less distinct pale stripe below eye; a very distinct black ocellated spot at base of caudal; dorsal, caudal and anal brownish, the membranes behind the spines blackish; ventrals black; pectorals plain translucent.

The Panama collection contains 14 specimens of this species, ranging in length from 95 to 145 mm. We have at hand a specimen, 180 mm. long, from Bahia, Brazil, for comparison. This specimen agrees perfectly with our Panama material, except in color, the pale stripes being broader in the Bahia specimen. Our specimens were all taken on coral reefs.

This fish heretofore has been known only from the coast of Brazil. Our specimens are from Toro Point and Colon.

411. Anisotremus surinamensis (Bloch). (Plate LVIII.)

Lutianus surinamensis Bloch, Naturg. Ausl. Fische, V, 1791, 3, Pl. CCLIII (Surinam).

Holocentrus gibbosus Lacépède, Hist. Nat. Poiss., IV, 1803, 344 (Surinam; after Bloch).

Pristipoma bilineatum Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 271 (Martinique).

Pristipoma melanopterum Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 273 (Brazil).

Hæmulon obtusum Poey, Memorias, II, 1860, 182 (Havana).

Hæmulon labridum Poey, Memorias, II, 1861, 419 (Cuba).

Anisotremus bilineatus Jordan, Proc. U. S. Nat. Mus., 1890, 320.

Anisotremus surinamensis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1318, Pl. CCVIII, fig. 537.

?Anisotremus surinamensis Snodgrass & Heller, Proc. Wash. Ac. Sci., VI, 1904 (1905), 376 (Galapagos Islands).

Head 2.7 to 3.05; depth 2.1 to 2.3; D. XII (rarely XIII), 16 to 18; A. III, 9 or 10; scales 45 to 53.

Body rather deep, compressed; anterior profile moderately steep, nearly evenly convex; head moderate; snout rather long and pointed, 2.4 to 4 in head; eye 3 to 5; mouth rather small, low, terminal, nearly horizontal; maxillary reaching to or past vertical from anterior margin of eye, 2.4 to 3.2 in head; teeth short, conical, in bands, the outer series slightly enlarged; preopercular margin slightly serrate; gill-rakers short, 16 or 17 more or less developed on the lower limb of the first arch; scales moderate, those on anterior part of body above lateral line not parallel with it, 6 or 7 oblique rows between the lateral line and origin of the dorsal; dorsal fin long, the spines high and strong, the fourth the longest, equal to length of snout and half to two-thirds of eye, the anterior rays of the soft part highest, the margin of the fin concave, the interradial membranes scaled; caudal fin covered with small scales, forked, the upper lobe the longer, anal fin with 3 spines, the second enlarged, as long as the longest dorsal spine, the soft portion densely scaled, its margin straight or slightly concave; ventral fins moderate, inserted slightly nearer origin of anal than tip of lower jaw; pectorals rather long, reaching nearly or quite to origin of anal, at least in adult, 2.9 to 3.75 in body.

Color dark brownish gray; each scale on upper anterior part of sides with a dark base; a dark area behind base of pectoral and above ventral; fins dusky, the anal and ventrals darkest. Young paler than the adults, with two dark longitudinal bars, one extending from eye along median line of side to below last rays of dorsal, followed by a large black spot at base of caudal, the other band extending from interorbital to under base of soft dorsal, parallel with the first.

This species is represented by 17 specimens, ranging in length from 60 to 450 mm. It inhabits chiefly rocky bottom.

Known from Florida to Brazil. Also recorded from the Pacific coast of tropical America and neighboring islands. We are, however, able to distinguish our Pacific coast representatives from those of the Atlantic, and if two forms actually exist on the Pacific side, we did not obtain them. Our specimens are from Toro Point, Colon and Porto Bello.

412. Anisotremus interruptus (Gill). (Plate LIX.)

Genytremus interruptus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 256 (Cape San Lucas; young).

Pristipoma fürthii Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXIV) Ichth. Beitr., V, 1876, 4, Pl. I (Panama).

Anisotremus surinamensis interruptus Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 485.

Anisotremus interruptus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1319; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 107 (Panama Bay); Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 410 (Panama).

Head 2.85 to 3.3; depth 2 to 2.4; D. XII (rarely XIII), 16 or 17; A. III, 8 or 9; scales 46 to 50.

Body rather deep, compressed; anterior profile very steep over snout, very gently convex over eyes, strongly convex at nape; head moderate; snout short and blunt, 2.65 to 3.2 in head; eye 2.85 to 3.8; mouth rather small, low, terminal, nearly horizontal; maxillary reaching a little past anterior margin of eye, 2.95 to 3.2 in head; teeth in the jaws conical, in bands, very short, the outer ones not notably enlarged; preopercular margin slightly serrate; gill-rakers short, 15 or 16 more or less developed on the lower limb of the first arch; scales rather large, notably enlarged anteriorly on upper part of body, the series above lateral line not parallel with it, 4 or 5 oblique rows between lateral line and origin of dorsal; dorsal fin long, the spines strong, the third or fourth usually the longest, equal to snout and about two-thirds the eye, the soft part anteriorly not elevated, its margin convex, the interradial membranes densely scaled; caudal fin covered with minute scales, the upper lobe the longer; anal fin with 3 spines, the second much enlarged, slightly longer than the longest dorsal spine, the soft portion densely scaled, with straight or slightly concave margin; ventral fins moderate, inserted a little nearer origin of anal than tip of lower jaw; pectoral fins rather long, reaching nearly to origin of anal, 2.9 to 3.1 in body.

Color in spirits brownish; each scale on upper anterior part of body with a large dark brown spot at base; pectorals pale, other fins dusky. Young with 2 black longitudinal bars, one of these from eye to just before base of caudal where it is interrupted, followed by a black spot at base of caudal, another stripe above this one and parallel with it.

We have 12 specimens of this species, ranging in length from 147 to 290 mm. This species is very close to *A. surinamensis*, from which it appears to differ in the notably larger scales on anterior part of body, and in the lighter ground color, making the dark bases of the scales on

anterior part of body stand out very distinctly. The snout in *A. interruptus* appears to be blunter and its profile steeper and the outline of the soft dorsal is convex, while in *A. surinamensis* it is concave. This fish is occasionally seen in the market.

Known from Lower California to Ecuador. Our specimens are from Naos Island, Balboa and Panama City.

413. Anisotremus virginicus (Linnæus). (Plate LX.)

Sparus virginicus Linnæus, Syst. Nat., Ed. X, 1758, 281 (South America).

Sparus vittatus Bloch, Naturg. Ausl. Fische, V, 1791, 33, Pl. CCLXIII, fig. 2 (Brazil).

Perca juba Bloch, Naturg. Ausl. Fische, VI, 1792, 77, Pl. CCCVIII, fig. 2 (Brazil).

Grammistes mauritii Bloch & Schneider, Syst. Ichth., 1801, 185 (after *Sparus vittatus* Bloch).

Pristipoma rodo Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 274(Martinique; Brazil; Puerto Rico; San Domingo).

Pristipoma acara pinima Castelnau, Anim. Nouv. Rares Amér. Sud, 1855, 8 (Brazil).

Pristipoma virginicum Günther, Cat. Fish. Brit. Mus., I, 1859, 288.

Anisotremus virginicus Gill, Proc. Ac. Nat. Sci. Phila., 1861, 106; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1322, Pl. CCIX, fig. 539; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 132 (Colon).

Pomadasys virginicus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 385.

Head 2.8 to 3.2; depth 1.9 to 2.1; D. XII, 16 or 17; A. III, 9 or 10; scales 56 to 63.

Body deep, compressed; anterior profile very steep, gently convex from snout to nape, from thence to dorsal strongly convex; head deep; snout rather short, 2.65 to 3.1 in head; eye 3 to 4.1; mouth small, terminal, nearly horizontal; maxillary reaching nearly or quite to anterior margin of eye, 3.3 to 3.7 in head; teeth in the jaws conical, in bands, the outer ones slightly enlarged; preopercle finely serrate; gill-rakers very short, 13 to 15 on the lower limb of first arch; scales rather small, reduced on head, not enlarged above lateral line and the series not parallel with it, 10 or 11 rows between the lateral line and origin of dorsal, 13 to 15 rows between the lateral line and origin of the anal; dorsal fin long, the spines strong, the third or fourth the longest, about equal to snout and half the eye, the second spine about three-

fourths the length of the third, the soft part with convex margin, the interradial membranes densely scaled; caudal fin moderately forked, both lobes rather acute, densely scaled; anal fin with 3 spines, the second notably enlarged, equal in length to the longest dorsal spine, the soft portion of the fin densely scaled, with straight or slightly convex margin; ventral fins moderate, inserted somewhat nearer origin of anal than tip of lower jaw; pectoral fins rather long, reaching opposite origin of anal, 2.75 to 3.2 in body.

Color greenish brown above, pale brown below; back and sides with alternating bluish and bronze stripes of about equal width; a jet black bar from nape through eye, another from origin of dorsal to or across base of pectoral; ventrals brownish, the outer ray reddish yellow; other fins all bronze colored.

There are 13 specimens of this species in the Panama collection, ranging in length from 73 to 245 mm. It is not very abundant, and was taken only on coral reefs. It is rarely seen in the market. This species is very closely related to *A. tæniatus*, from which it may be distinguished by the color, by the notably steeper anterior profile, and by the much more numerous scales on the fins.

Known from Florida to Brazil. Our specimens are from Toro Point, Colon and Porto Bello.

414. Anisotremus tæniatus Gill. (Plate LXI.)

Anisotremus tæniatus Gill, Proc. Ac. Nat. Sci. Phila., 1861, 107 (Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1322; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 108 (Panama Bay); Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 410 (Panama).

Head 2.9 to 3.3; depth 1.95 to 2.4; D. XII, 16 or 17; A. III, 9 or 10; scales 49 to 57.

Body rather deep, compressed; anterior profile steep, gently convex over eyes and snout, strongly convex at nape; head deep; snout rather short, 2.75 to 3.7 in head; eye 2.7 to 3.9; mouth small, terminal, slightly oblique; maxillary reaching nearly or quite to anterior margin of eye, 3 to 3.5 in head; teeth in the jaws conical, in bands, the outer ones enlarged; preopercle serrate; gill-rakers short, 13 to 15 on the lower limb of the first arch; scales rather small, somewhat reduced on head, not enlarged above lateral line and the series not parallel with it, 10 or 11 rows between the lateral line and origin of dorsal, 15 or 16 between the lateral line and origin of anal; dorsal fin long, the spines strong, the third or fourth longest, usually a little longer than snout,

the interradial membranes with minute scales; caudal fin well forked, both lobes acute, the upper one the longer, mostly covered with small scales; anal fin with 3 strong spines, the second enlarged, reaching nearly or quite to tips of anterior rays, about equal in length to longest dorsal spine, the soft portion short, with nearly straight margin, small scales on interradial membranes; ventral fins moderate, the outer ray without a filament, inserted a little nearer origin of anal than tip of lower jaw; pectoral fins long, reaching opposite origin of anal, 3.1 to 3.5 in body.

Color golden yellow; sides with blue streaks, edged with black; a broad black bar from nape through eye, another bar from origin of dorsal to base of pectoral; fins all yellow.

This species is represented by 25 specimens, ranging in length from 100 to 300 mm. It is quite common at Panama City and may be seen in the market almost daily, being of considerable value as food.

Known from Mazatlan to Ecuador. Our specimens were taken at Balboa and Panama City.

Family LVI. Sparidæ.

The Porgies.

Body oblong or ovate, usually notably compressed, the back more or less elevated; head large; mouth small, nearly or quite horizontal; premaxillaries little protractile; maxillary slipping under preorbital for most of its length, supplemental bone present; preorbital usually broad; teeth strong, those on anterior part of jaws incisor- or molar-like or conical, those at sides always blunt molars; no teeth on vomer or palatines; gills 4, a slit behind the fourth; gill-membranes separate, free from the isthmus, the rakers rather small or obsolete; opercles without spines; lateral line complete, not extending on caudal fin, concurrent with the outline of the back; scales rather large and firm, finely crenulate; dorsal fin long, continuous, or notched, the spines usually strong, depressible in a groove, 10 to 13 in number; caudal fin usually forked; anal fin with 3 spines, the soft part similar to that of the dorsal; ventral fins subthoracic, with I, 5 rays.

KEY TO THE GENERA.

a. Front teeth conical or pointed, not compressed.

b. Second interhæmal spine enlarged, hollowed anteriorly. *Calamus*, p. 572.

bb. Second interhæmal spine normal, not hollowed. *Pagrus*, p. 576.

aa. Front teeth broad, incisors.

c. Dorsal fin preceded by a small antrorse spine; body with dark cross-bars, sometimes becoming indistinct or disappearing with age; no black spot on caudal peduncle. *Archosargus*, p. 577.

cc. Dorsal fin without antrorse spine; body without black bars; a large black spot on caudal peduncle. *Diplodus*, p. 579.

155. Genus **Calamus** Swainson.

Calamus Swainson, Nat. Hist. & Class. Fish., II, 1839, 221 (type *Pagellus calamus* Cuvier & Valenciennes = *Calamus megacephalus* Shaw).

Grammateus Poey, Ann. Lyc. Nat. Hist. N. Y., X, 1874, 182 (type *Pagellus microps* Guichenot = *Pagellus penna* Cuvier & Valenciennes).

Body rather deep, compressed; the back elevated; head moderate; preorbital deep; mouth small; teeth in front on jaws conical or pointed; those at sides molar; preopercle entire; posterior nostril slit-like; dorsal fin continuous, the fin not deeply notched, the soft rays low, not scaly; caudal fin forked; anal fin with 3 rather short spines, the soft portion similar to that of the dorsal; pectoral fins long; second interhæmal bone enlarged, hollowed anteriorly, forming a groove or hollow cone in which rests the posterior end of the air bladder. Two species of this genus were secured; one on each coast.

KEY TO THE SPECIES.

a. Scales large, 39 to 44 transverse series below lateral line; 5 or 5½ rows between the lateral line and base of first dorsal spine; 10 or 11 between lateral line and base of first anal spine; 4 rows on cheeks. *penna*, p. 572.

aa. Scales moderate, 43 to 46 transverse series below lateral line; 6 or 6½ rows between the lateral line and base of first dorsal spine; 12 or 13 between lateral line and base of first anal spine; 5 or 6 rows on cheeks. *brachysomus*, p. 574.

aaa. Scales rather small, 50 to 53 transverse series below lateral line; 6½ or 7 between lateral line and base of first dorsal spine; 14 or 15 between lateral line and base of first anal spine; 7 rows on cheeks. *calamus*, p. 575.

415. **Calamus penna** (Cuvier & Valenciennes).

Pagellus penna Cuvier & Valenciennes, Hist. Nat. Poiss., VI, 1830, 209 (Brazil).

Pagellus microps Guichenot, in Sagra, Hist. Phys. Polit. Nat. Cuba, Pt. II, 1853, 188, Pl. III, fig. 1 (Havana).

Pagellus humilis Poey, Syn. Pisc. Cub., 1868, 308 (Havana).

Grammateus humilis Poey, Enumeratio, 1875, 56.

Pagellus milneri Goode & Bean, Proc. U. S. Nat. Mus., 1879, 134 (Charlotte Harbor, Fla.).

Sparus milneri Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883. 556.

Calamus penna Jordan & Gilbert, Proc. U. S. Nat. Mus., 1884, 21.

Head 3 to 3.8; depth 2 to 2.3; D. XII, 12 or rarely 11; A. III, 10; transverse series of scales below lateral line 39 to 44.

Body deep, compressed; the back much elevated; anterior profile strongly convex; head rather short and deep; snout not greatly in advance of forehead, its length 1.7 to 2.9 in head; eye 2.7 to 3.7; preorbital about one-fourth broader than eye in specimens 170 mm. in length, notably narrower than eye in specimens 85 mm. and less in length; mouth rather small, nearly horizontal, the lower jaw slightly included; maxillary reaching slightly past anterior margin of eye, 2.35 to 3.15 in head; each jaw anteriorly with a patch of conical teeth, the outer ones somewhat enlarged, sides of jaws with 2 or 3 rows of molars, the teeth of the inner row the broadest; lateral line complete, concurrent with outline of the back; scales rather large, finely serrate, 5 or 5½ rows of scales between the lateral line and origin of the dorsal, 10 or 11 rows between the lateral line and origin of anal, 4 rows on cheeks, wanting on snout, present on base of caudal fin; dorsal fin long, the spines pungent, the third or fourth spine the longest, somewhat longer than the depth of the preorbital, the soft part low; caudal fin rather deeply forked, the lobes sharply pointed, equal to or longer than head; anal fin with 3 short spines, the second and third of about equal length, the soft portion of fin similar to that of the dorsal; ventral fins moderate, inserted notably nearer origin of anal than tip of lower jaw; pectoral fins rather long, longer than head, except in young of less than 90 mm. in length, 3 to 3.4 in body.

Color in alcohol grayish green with silvery reflections; sides with 7 or 8 dark bars. The young notably darker than the adult. Our largest specimens with a dark area in front of and below the eyes, and with the margin of the preopercle dusky. Fins all more or less blotched with dusky; ventrals often dusky; base of upper ray of pectoral with small black spots.

There are 17 specimens in the Panama collection, ranging in length from 45 to 170 mm. This species, although reaching only a small size, is frequently seen in the markets, and is of some value as food.

Known from Florida to Brazil. Our specimens were taken at Toro Point, Colon and Porto Bello.

416. Calamus brachysomus (Lockington).

Sparus brachysomus Lockington, Proc. U. S. Nat. Mus., 1880, 284 (Magdalena Bay, Lower California).

Chrysophrys calamus Günther, Trans. Zoöl. Soc. London, VI, 1869, 421 (Panama; in part).

Calamus brachysomus Evermann & Jenkins, Proc. U. S. Nat. Mus., 1891, 153 (Guaymas); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1353; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 112 (Panama Bay).

Calamus brachysoma Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 335, 1899, 7 (Sta. Elena Bay, Ecuador).

Head 3 to 3.35; depth 1.95 to 2.15; D. XII, 12; A. III, 10 (rarely 9); scales below lateral line 43 to 46.

Body deep, compressed; the back much elevated; dorsal profile nearly straight over snout, strongly convex at nape, gradually descending from the base of the anterior dorsal spines backward; head rather short; snout tapering, 1.55 to 3 in head; eye 2.8 to 4.2; preorbital about twice the width of eye in specimens 400 mm. in length, about half the eye in young 55 mm. in length; mouth rather small, nearly horizontal, the lower jaw included; maxillary about reaching vertical from anterior margin of eye, 2.15 to 3.1 in head; each jaw anteriorly with a patch of conical teeth, the outer ones slightly enlarged, at sides with 2 or 3 rows of molars, the teeth of the inner row the broadest; lateral line complete, concurrent with the outline of the back; scales moderate, finely crenate, 6 or 6½ rows between lateral line and origin of dorsal, 12 or 13 between lateral line and origin of anal, 5 or 6 rows on cheeks, wanting on snout, present on caudal fin; dorsal fin long, the spines slender, the third or fourth the longest, equal to or slightly longer than half the head, the soft part short and low; caudal fin forked, the lobes somewhat produced in adult, the upper one the longer, equal to length of head; anal fin with 3 strong spines, the second one the longest, although not reaching past the third when deflexed, the soft portion similar to that of the dorsal; ventral fins moderate, inserted a little nearer origin of anal than tip of lower jaw; pectoral fins much produced in adult, moderately long in young, 2.2 to 3.1 in body.

Color in alcohol of large specimens greenish to silvery, area about eye and snout to upper lip black; margin of opercle and preopercle black; a more or less distinct dark area above lower part of pectoral; fins mostly colorless, the pectoral with a dark spot at the base of the upper

rays. Young darker, with narrow black cross-bars and dark blotches which are extended on the fins.

This species is represented by 9 specimens, ranging from 50 to 435 mm. in length.

Known from the Gulf of California south to Guayaquil. Our specimens were taken by the use of dynamite at Taboga Island and Balboa.

417. Calamus calamus (Cuvier & Valenciennes).

Pagellus calamus Cuvier & Valenciennes, Hist. Nat. Poiss., VI, 1830, 206, Pl. CLII (Martinique; San Domingo).

Calamus megacephalus Swainson, Nat. Hist. & Class. Fish., II, 1839, 222 (after Cuvier & Valenciennes).

Chrysophrys calamus Günther, Cat. Fish. Brit. Mus., I, 1859, 487 (in part).

Pagellus orbitarius Poey, Memorias, II, 1860, 201 (Havana).

Calamus macrops Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 927 (not of Poey).

Calamus calamus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1884, 16; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1349, Pl. CCXII, fig. 546; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 47 (Natal, Brazil).

Head 3.25 to 4.1; depth 2 to 2.15; D. XII, 12; A. III, 11; transverse series of scales below lateral line 50 to 53.

Body deep, quite strongly compressed; the back much elevated; anterior profile steep, strongly convex at nape; head deep; snout short, its length 1.5 to 1.7 in head; eye 3.4 to 3.6; preorbital broad, twice as wide as eye in specimens 300 mm. in length; mouth small, horizontal; maxillary failing to reach anterior margin of eye, 2.4 to 2.7 in head; each jaw anteriorly with a patch of conical teeth, the outer ones somewhat enlarged, a few of them directed forward in large examples, sides of the jaws with 2 or 3 rows of molars; lateral line complete, concurrent with the outline of the back; scales rather small, very finely crenate, 6½ or 7 rows between lateral line and origin of dorsal, 14 or 15 between lateral line and origin of anal, about 7 rows on cheeks, wanting on snout, present on caudal fin; dorsal fin long, the third or fourth spine the longest, about equal to width of preorbital, the soft part rather high; caudal fin moderately forked; anal fin with 3 strong spines, the soft portion similar to that of the dorsal; ventral fins inserted somewhat nearer origin of anal than tip of snout; pectoral fins long, 2.7 to 2.8 in body.

Color in alcohol grayish silvery; the snout below and in front of eyes dusky.

This species was not obtained at Panama, but, since it has been recorded from localities both north and south of the Isthmus, it may be expected to be found there at a later time. The above description is based on 3 specimens in the National Museum taken at Nassau, ranging from 190 to 300 mm. in length.

Known from Florida to Brazil.

156. Genus **Pagrus** Cuvier.

Pagrus Cuvier, Règne Animal, Ed. I, II, 1817, 272 (type *Sparus argenteus* Bloch & Schneider = *Sparus pagrus* Linnæus).

Body oblong, compressed; head large; mouth rather small, terminal, low; jaws anteriorly with pointed teeth, the outer series usually enlarged, not compressed, both jaws with 2 or 3 series of rounded molar teeth at sides, occasionally intermixed with pointed teeth; posterior nostril oblong; opercle entire; gill-rakers short; dorsal fin long and low, the spines about 12 in number; caudal fin forked; anal spines moderate, the second not greatly enlarged; second interhæmal spine not hollowed or grooved. This genus is not represented in the Panama collection, but the single known species is of wide distribution and may occasionally occur on the Atlantic coast of Panama.

418. Pagrus pagrus (Linnæus).

Sparus pagrus Linnæus, Syst. Nat., Ed. X, 1758, 279 (southern Europe).

Sparus argenteus Bloch & Schneider, Syst. Ichth., 1801, 271.

Pagrus argenteus Cuvier, Règne Animal, Ed. I, II, 1817, 272.

Pagrus vulgaris Cuvier & Valenciennes, Hist. Nat. Poiss., VI, 1830, 142 (southern Europe).

Pagrus pagrus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1356, Pl. CCXV, fig. 551.

Head 3.95; depth 3.3; D. XII, 11; A. III, 8; transverse series of scales below lateral line 54.

Body moderately elongate, compressed; the back elevated; anterior profile rather strongly convex; head very deep; snout moderate, its length 2.1 in head; eye 4.1; mouth moderate, nearly horizontal, the lower jaw slightly included; maxillary reaching a little past anterior margin of eye, 2.4 in head; jaws anteriorly with rather strong canines followed by small conical teeth behind, sides of jaws with 2 series of rather narrow, blunt molars; preorbital notably broader than eye in specimen 460 mm. in length; gill-rakers short and blunt, about 9 on

lower limb of first arch; scales rather large, finely serrate, 6 rows between lateral line and origin of dorsal, 13 between lateral line and origin of anal; dorsal fin long, the spines rather slender, the third the longest, about equal to length of snout, the soft part very short; caudal fin rather deeply forked, the lobes pointed, anal fin with 3 spines, the third the longest, notably shorter than the longest dorsal spine, the soft part similar to that of the dorsal; ventral fins moderate, inserted nearer origin of anal than tip of lower jaw; pectoral fins long, 3.95 in body.

"Color golden-olive, the middle of each scale largely pinkish-red, giving a general reddish hue to the fish; sides and below silvery, flushed with red; many scales of back and sides each with a small round spot of deep purplish-blue, those forming distinct longitudinal streaks on the sides below lateral line, the series somewhat irregular, running along the margins of the scales; above the lateral line these spots are somewhat scattered, forming very irregular oblique series, running upward and backward; a few of these spots on nape, and upper part of opercle; a dark spot on upper part of orbital rim; snout tinged with purplish, occiput with olive; edge of opercle dusky; ventral fins largely orange, their edges translucent; spinous dorsal somewhat dusky; ventrals pale, with a pinkish blotch at base; pectorals yellowish, especially at base, the axil somewhat dusky." (Jordan & Evermann.)

This species is not yet known from Panama, but it is a widely distributed species, which will very probably sooner or later be taken there. We have examined one specimen, 460 mm. in length, from Florida which is in the National Museum. This specimen forms the basis for the above description.

Known from southern Europe, and from South Carolina to Argentina.

157. Genus **Archosargus** Gill.

Archosargus Gill, Canadian Naturalist, II, 1865, 266 (type *Sparus probatocephalus* Walbaum).

Salema Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 390 (type *Perca unimaculata* Bloch).

Body short and deep; head short; mouth moderate; jaws anteriorly with broad incisors, with entire or with slightly notched margins, jaws at sides with coarse molars; posterior nostril slit-like; opercles entire; gill-rakers small; dorsal fin long, continuous, preceded by an antrorse spine, the spines strong, the soft part short; caudal fin forked; anal fin with 3 strong spines, the second more or less enlarged; ventral

fins subthoracic. Body with dark cross-bars which sometimes become vague or disappear in adult. A single species of this genus was taken on the Atlantic coast of Panama. A few others, however, may be expected there.

KEY TO THE SPECIES.

a. Dorsal spines 13; sides with golden stripes and dark bars, the latter present only in young less than 150 mm. in length. *unimaculatus*, p. 578.

aa. Dorsal spines 12; sides without golden stripes, but with broad, black, persistent bars. *aries*, p. 579.

419. Archosargus unimaculatus (Bloch).

Perca unimaculata Bloch, Naturg. Ausl. Fische, VI, 1792, Pl. CCCVIII, fig. 1 (Brazil; based on a figure by Prince Maurice).

Grammistes unimaculatus Bloch & Schneider, Syst. Ichth., 1801, 184 (after Bloch).

Sargus humeri-maculatus Quoy & Gaimard, in Freycinet, Voy. Uranie et Physicienne, Zoöl., 1824, 297 (Rio de Janeiro).

Sargus flavolineatus Cuvier & Valenciennes, Hist. Nat. Poiss., VI, 1830, 60 (Cuba).

Sargus unimaculatus Cuvier & Valenciennes, Hist. Nat. Poiss., VI, 1830, 62.

Cynædus brama Gronow, Cat. Fish, 1854, 56 (South Carolina).

Sargus caribæus Poey, Memorias, II, 1860, 197 (Cuba).

Diplodus caribæus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 930.

Diplodus flavolineatus Jordan, Proc. U. S. Nat. Mus., 1886, 42.

Archosargus unimaculatus Jordan & Fesler, Rept. U. S. Fish. Comm., XVII, 1889-91 (1893), 520; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1359, Pl. CCXVI, fig. 553; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 402 (Colon), and 1917, 132 (Colon).

Head 2.8 to 3.7; depth 1.85 to 2.5; D. XIII, 11 or 12; A. III, 10 or 11; scales 43 to 48.

Body deep, compressed; the back elevated; anterior profile slightly concave above eyes in adult; head rather short; snout blunt, 2.3 to 3.3 in head; eye 3 to 3.7; preorbital rather broad, equal to length of eye in adult (specimens 230 mm. in length), not more than half the width of eye in specimens 90 mm. in length; mouth rather small, nearly or quite horizontal, the lower jaw slightly included; maxillary reaching to or slightly past anterior margin of eye, 3 to 3.4 in head; anterior margin of jaws with a series of broad incisors, each with broadly

concave margin, broad molar teeth behind the incisors and in sides of jaws; gill-rakers very short, 6 or 7 more or less developed on lower limb of first arch; lateral line complete, concurrent with the outline of the back; scales rather large, finely crenate, 7 or 8 rows between lateral line and base of first dorsal spine, 13 or 14 between lateral line and first anal spine, 5 rows on cheeks, wanting on snout, present on caudal fin; dorsal fin long, the spines strong, the fourth the longest, equal to length of snout and half the eye, the soft part low, much shorter than the spinous part; caudal fin moderately forked, the upper lobe the longer, about equal to length of head; anal fin with 3 very strong spines, the second one the longest, nearly or quite as long as the longest dorsal spine, the soft portion of fin similar to that of the dorsal; ventral fins rather large, not much shorter than head, inserted slightly nearer origin of anal than tip of lower jaw; pectoral fins very long, 2.35 to 3 in head.

Color brownish above, silvery below; sides with yellowish stripes; a black spot on lateral line below origin of dorsal; fins mostly unmarked, the dorsal with a narrow black margin.

This is a common species on the Atlantic coast of Panama. We preserved 63 specimens, ranging from 25 to 230 mm. in length. It is a food fish of some importance and may be seen daily in the Colon market.

Known from Florida south to Rio de Janeiro. Our specimens were taken at Toro Point, Mindi Cut, Colon and Porto Bello.

420. Archosargus aries (Cuvier & Valenciennes).

Sargus aries Cuvier & Valenciennes, Hist. Nat. Poiss., VI, 1830, 58 (Rio de Janeiro; Maracaibo).

Archosargus probatocephalus aries Eigenmann & Hughes, Proc. U. S. Nat. Mus., 1887, 69.

Archosargus aries Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 522; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1361.

A second species of this genus may be expected to be found on the Atlantic coast of Panama, as it has been recorded from localities both north and south of the isthmus. It was, however, not seen by us. From descriptions at hand it seems to be very similar to the northern sheepshead, *A. probatocephalus* (Walbaum). From *A. unimaculatus* it may be distinguished by the persistent cross-bars and by having 12 instead of 13 spines in the dorsal fin. It also reaches a much larger size.

Known from Honduras to Brazil.

158. Genus **Diplodus** Rafinesque.

Diplodus Rafinesque, Ind. d'Itt. Sicil., etc., 1810, 54 (type *Sparus annularis* Linnæus).

Sargus Cuvier, Règne Animal, Ed. I, II, 1817, 272 (type *Sparus sargus* Linnæus).

Body deep, more or less compressed; the back elevated; head deep; mouth rather small, low, terminal; jaws anteriorly with broad incisors, with truncate or entire margins, a series of small teeth behind the incisors, jaws at sides with 2 or 3 rows of molars; gill-rakers short and slender; intestinal canal short; dorsal spines strong, usually 12 in number, not preceded by an antrorse spine; caudal fin forked; anal fin with 3 rather strong spines; second interhæmal spine normal; body without dark cross-bars; a black blotch on caudal peduncle.

421. **Diplodus argenteus** (Cuvier & Valenciennes).

Sargus argenteus Cuvier & Valenciennes, Hist. Nat. Poiss., VI, 1830, 60 (Brazil).

Sargus caudimacula Poey, Memorias II, 1860, 198 (Cuba).

Diplodus argenteus Eigenmann & Hughes, Proc. U. S. Nat. Mus., 1887, 73; Berg, Anal. Mus. Nac. Buenos Aires, IV, 1895, 49 (Montevideo; Embocadura del Rio de la Plata).

Head 3.2 to 3.35; depth 1.9 to 2.2; D. XII, 14 or 15; A. III, 13 or 14; vertical series of scales below lateral line 56 to 60.

Body deep, compressed; the back notably elevated; anterior profile evenly convex in young, straight or slightly concave above eyes in adult; head short; snout moderate, its length 2 to 2.25 in head; eye 3.2 to 3.8; mouth moderate, horizontal, terminal; maxillary scarcely reaching anterior margin of eye, 2.95 to 3.05 in head; jaws anteriorly with strong incisors, with entire margins; sides of jaws with 2 or 3 series of molars; preorbital moderate, about two-thirds the width of eye in specimens 200 mm. in length, half the width of eye in individuals 145 mm. in length; scales moderate, finely crenate, wanting on snout, but present on caudal fin, 8 rows between lateral line and origin of dorsal, 14 rows between lateral line and origin of anal; dorsal fin long, the spines strong, the third the longest, nearly as long as head without snout, the soft part low; caudal fin forked, the lobes pointed; anal fin with 3 strong spines, the second one somewhat enlarged, stronger than the longest dorsal spine, but not quite as long, the soft portion similar to that of the dorsal; ventral fins rather long, inserted nearer origin of anal than tip of snout; pectoral fins long, reaching past origin of anal in adult, proportionately shorter in young, 2.6 to 3.2 in body.

Color in alcohol bluish above, silvery below; opercle with a dusky border; a large black spot on sides of caudal peduncle, below and behind base of last dorsal ray; upper rays of pectoral with a black spot at base.

This species is as yet not known from Panama, but is here included because it is recorded from localities both north and south of the Isthmus. It is here described from specimens from the Bermuda Islands and from Cuba.

Known from Florida south to Argentina.

Family LVII. Gerridæ.

The Mojarras.

Body oblong or elevated, compressed, covered with large smooth scales; lateral line usually concurrent with the back; mouth moderate, extremely protractile; the spines of the premaxillaries extending to above eye, closing a deep groove on the top of the head; maxillary without supplemental bone, not slipping under preorbital; base of mandible scaly, a slit behind it and the preorbital to permit its free motion; both jaws with slender, villiform teeth; no incisors or molars; no teeth on vomer or palatines; nostrils double; pseudobranchiæ concealed; gill membranes separate, free from the isthmus; dorsal fin single, continuous or deeply notched; spinous and soft portion usually about equally developed, with a scaly sheath along base; dorsal spines usually 9 or 10; anal spines 2 or 3; ventral fins thoracic, I, 5, inserted slightly behind the pectorals; branchiostegals 6; lower pharyngeal bones close together, the teeth blunt; air bladder present; pyloric cæca rudimentary; vertebræ 10 + 14 = 24. Oviparous. Carnivorous. The large species are valued as food*.

KEY TO THE GENERA.

a. Second interhæmal spine hollow, cone shaped, its cavity entered by the posterior end of the air bladder; preopercle entire; anal spines 3, the second not much enlarged. *Eucinostomus*, p. 582.

aa. Second interhæmal spine normally developed, not hollow, and not entered by the air bladder; preopercle entire, or serrate; anal spines 2 or 3, the second large or small.

b. Second interhæmal small; anal spines 2, the second small; preopercle entire. *Ulæma*, p. 588.

*It was found necessary, in order that the true relationship of the species of *Gerridæ* occurring in the Panama collection might be understood, to make a study of all of the American forms and for that reason keys and descriptions for all species studied have been included.

bb. Second interhæmal long, spear-shaped; anal spines 2 or 3, the second enlarged.

c. Preopercle entire; the second anal spine moderate.
Gerres, p. 589.

cc. Preopercle serrate; the second anal spine much enlarged.
Diapterus, p. 591.

159. Genus **Eucinostomus** Baird and Girard.

Eucinostomus Baird & Girard, in Baird, 9th Rept. Smith. Inst., 1854 (1855), 345 (type *Eucinostomus argenteus* Baird & Girard = *Gerres gula* Cuvier & Valenciennes).

Second interhæmal spine enlarged, forming a hollow cone which is entered by the posterior end of the air bladder; preorbital and preopercle entire; body comparatively elongate; anal spines 2 or 3, the second anal and dorsal spines not greatly enlarged.

KEY TO THE SPECIES.

a. Premaxillary groove crossed or at least almost crossed by scales in front, leaving a naked pit behind; body compressed, rather deep. *gula*, p. 582.

aa. Premaxillary groove not crosssed by scales in front, usually open and linear, sometimes slightly restricted by scales in front, and wider posteriorly; body less compressed, rather slender.

b. Anal spines 3.

c. The back moderately elevated; the body moderately compressed, the depth 2.5 to 3.3 in the length; anal spines rather strong, the second enlarged, much stronger than the third.
californiensis, p. 584.

cc. The back scarcely elevated; the body little compressed, the depth 3.5 to 4.2 in the length; anal spines very weak, the second scarcely stronger than the third.
californiensis elongatus subsp. nov., p. 586.

bb. Anal spines 2. *meeki*, p. 587.

422. Eucinostomus gula (Cuvier & Valenciennes).

Gerres gula Cuvier & Valenciennes, Hist. Nat. Poiss., VI, 1830, 464 (Martinique).

Eucinostomus argenteus Baird & Girard, in Baird, 9th Rept. Smith. Inst., 1854 (1855), 345 (Beesley's Point, New Jersey).

Eucinostomus gulula Poey, Enumeratio, 1875, 54, Pl. II (Havana).

Diapterus homonymus Goode & Bean, Proc. U. S. Nat. Mus., 1879, 340 (Clearwater Harbor).

Gerres argenteus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 584.

Gerres homonymus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 584.

Eucinostomus gula Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1370; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 133 (Colon).

Head 2.8 to 3.4; depth 2.2 to 3; D. IX, 10; A. III, 7; scales 44 to 48.

Body elliptical in form, moderately compressed, varying greatly in depth; back moderately elevated; anterior profile evenly and gently convex, except for slight depression between eyes; snout 3.1 to 3.8 in head; eye 2.4 to 2.9; mouth small, the maxillary reaching to, or slightly past anterior margin of orbit; premaxillary groove closed or nearly closed with scales in front, leaving a naked pit behind; preorbital and preopercle entire; gill-rakers small, 7 below angle on first arch; dorsal spines rather weak, the second and third almost equal in length; second anal spine shorter but noticeably stronger than the third, about half as long as the second dorsal spine, 2.6 to 3.8 in head; pectorals long, reaching to vertical of origin of anal fin; ventrals rather short, usually not reaching to vent; second interhæmal spine cone-shaped, hollow, entered by the posterior end of air bladder; air bladder with two small appendages anteriorly, extending forward to the cranium at the sides, tapering posteriorly, coming to a point inside the hollow interhæmal spine; stomach with 3 cæca, contents partly digested crustacea, molluscs and algæ.

Color silvery, with bluish reflections above; dorsal, caudal and anal more or less dusky; pectorals and ventrals pale; spinous dorsal with black margin.

This species, although usually easily separated from *E. californiensis* by the deeper body and premaxillary groove scaling, has representatives that make the separation extremely difficult. One lot from Porto Bello, and two lots from Fox Bay, Colon, have the premaxillary groove only partly closed by scales. These examples are no deeper than other examples of the same lots that have the premaxillary groove open and linear (*E. californiensis*) but, on the other hand, they are just as deep as some of the examples of the same lots that have the premaxillary groove completely closed by scales in front. The depth, in length of body, of those with the premaxillary groove completely closed varies from 2.4 to 3; of those with the premaxillary groove partly closed it varies from 2.5 to 3; and those with the groove open and linear (*E. californiensis*) the depth in length varies from 2.7 to 3.2. *E. gula*

usually has only 3 rows of scales between lateral line and middle of dorsal fin, while *E. californiensis* usually has 4. These lots then indicate that the two species intergrade. They are here, however, tentatively kept separate.

This species was found to be rather common along the Atlantic coast of Panama, but it was nowhere as abundant as its nearest relative, *E. californiensis*. The present collection contains 123 specimens, ranging from 60 to 120 mm. in length.

Known from Woods Hole, Mass., south to Brazil. Our specimens are from Toro Point, Mindi Cut, Fox Bay, Colon; Colon Reef, and Porto Bello.

423. Eucinostomus californiensis (Gill). (Plate LXII, fig. 1.)

Diapterus californiensis Gill, Proc. Ac. Nat. Sci. Phila., 1862, 245 (Cape San Lucas).

Diapterus gracilis Gill, Proc. Ac. Nat. Sci. Phila., 1862, 246 (Cape San Lucas).

Diapterus dowii Gill, Proc. Ac. Nat. Sci. Phila., 1863, 162 (Panama).

Eucinostomus pseudogula Poey, Enumeratio, 1875, 53, Pl. I (Havana); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1368; Smith, N. C. Geol. & Econ. Surv., II, 1907, 304.

Gerres jonesii Günther, Ann. & Mag. Nat. Hist., Ser. 5, III, 1879, 150 and 389 (Bermudas).

Eucinostomus harengulus Goode & Bean, Proc. U. S. Nat. Mus., 1879, 132 (Key West, Florida); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1368.

Gerres harengulus Jordan & Gilbert, Bull. U. S. Nat. Mus., XVI, 1883, 584.

Gerres dowi Evermann & Meek, Proc. Ac. Nat. Sci. Phila., 1886, 259.

Gerres pseudogula Evermann & Meek, Proc. Ac. Nat. Sci. Phila., 1886, 260.

Gerres gracilis Evermann & Meek, Proc. Ac. Nat. Sci. Phila., 1886, 261.

Gerres californiensis Evermann & Meek, Proc. Ac. Nat. Sci. Phila., 1886, 263.

Gerres californiensis cinereus Eigenmann (R. S.), American Naturalist, XXV, 1891, 155 (San Diego).

Eucinostomus californiensis Jordan, Proc. Cal. Ac. Sci., 2nd Ser., 1895, 469; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1369; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 113; Starks, Proc. U. S. Nat. Mus., 1906, 792; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 410 (Panama).

Eucinostomus dowi Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1367.

Head 2.7 to 3.5; depth 2.5 to 3.3; D. IX, 10; A. III, 7; scales 44 to 48.

Body elongate, moderately compressed, varying greatly in depth; back moderately elevated; anterior profile nearly straight; snout 2.7 to 3.8 in head; eye 2.4 to 3.5; mouth small; maxillary reaching slightly past anterior margin of orbit; premaxillary groove open and linear in young, in large examples often oval and restricted by scales in front; preorbital and preopercle entire; gill-rakers weak, 7, occasionally 8, below angle of first arch; dorsal spines rather weak, moderately elevated, the second a little shorter than the third; second anal spine varying greatly in length, shorter than the third but much stronger, about half the length of the second dorsal spine, 2.3 to 4.4 in head; pectoral fins reaching to vertical from vent; ventrals rather short, often not reaching to vent; second interhæmal spine in the form of a hollow cone, which the air bladder enters; air bladder with two small appendages anteriorly, extending forward to the cranium at the sides, tapering posteriorly, coming to a point inside the hollow interhæmal spine; stomach with 2 or 3 cæca, varying greatly in size, contents partly digested crustacea, molluscs and plant tissue (algæ?). (Five stomachs examined.)

Color greenish above, with bluish reflections, silvery below. A large number of our smaller specimens both from the Atlantic and Pacific have irregular dark bars and blotches on sides; these are absent on all large specimens, as well as on many small ones. This difference in coloration does, however, not carry any structural differences with it. Pectorals pale; all other fins usually more or less dusky; anal and ventrals often pale; spinous dorsal with black margin.

The forms here placed in synonomy have been held as distinct species chiefly on the following characters: depth of body, size of eye, length of snout, and the length of the second anal spine. These characters are all variable and that all of them intergrade is evident from the study of our large series, together with the study of the large number of specimens in the U. S. National Museum collection.

In placing all of these forms under *E. californiensis*, we are merely verifying what has already been noted by Evermann & Meek (Proc. Ac. Nat. Sci. Phila., 1886, p. 262), who state: "There seems to be no difference between the *'harengulus'* of the East Coast and the West Coast *'gracilis'*"; and Jordan & Evermann (1898, pp. 1368 and 1369), who say: "Specimens very similar [to *E. dowii*] have been taken at

Key West and Havana, but these may be referable to *Eucinostomus harengulus*. * * * * * premaxillary groove long, linear and naked in young specimens (*gracilis*), becoming in older examples (*californiensis*) more or less oval and sometimes forming a rounded pit." Gilbert & Starks (1904) state: "Our extensive series seems to prove *E. dowii* to be invalid." Jordan & Dickerson (Proc. U. S. Nat. Mus., 1908, p. 16) add: "These agree with *Eucinostomus pseudogula;* but, on the other hand, they can not be distinguished from *Eucinostomus harengulus,* by comparison of either with the description of the species or with specimens (Mayaguez, Porto Rico). It would therefore seem probable that *pseudogula* and *harengulus* are identical."

This species was found very abundant on both coasts of Panama, running up brackish water streams. Numerous specimens, ranging in length from 45 to 200 mm., were preserved.

This species ranges on the Pacific coast from California south to Ecuador; on the Atlantic coast it ranges from North Carolina south to Brazil. Our specimens from the Pacific coast are from the following localities: Chame Point, Taboga Island, Naos Island, Corozal, Balboa, Panama City market, and Rio Juan Diaz, Juan Diaz. Atlantic coast specimens are from: Toro Point, Mindi Cut, Fox Bay, Colon; Colon Reef, Colon market, and Porto Bello.

424. Eucinostomus californiensis elongatus *subsp. nov.* (Plate LXII, fig. 2.)

Type No. 81732, U. S. N. M.; length 86 mm.; Taboga Island, Panama.

Head 3.15 to 3.44; depth 3.5 to 4.2; D. IX, 10; A. III, 7; scales 45 to 47.

Body long and slender, but little compressed; the back only slightly elevated; anterior profile straight from tip of snout to posterior margin of orbits, there becoming slightly convex; snout 2.9 to 3.5 in head; eye 2.8 to 3.25; mouth small, the maxillary reaching slightly past anterior margin of eye; premaxillary groove linear and free from scales, preorbital and preopercle entire; gill-rakers small, 7, occasionally 8, below angle on first arch; dorsal spines weak and flexible, the second a little shorter than the third; anal spines also weak, the second little shorter than the third and only slightly stronger, 3.2 to 4.4 in head; pectorals reaching about to vertical from anal opening; ventrals very short, not nearly reaching to vent; second interhæmal spine modified into the form of a hollow cone, which the air bladder enters; air bladder

with two anterior appendages extending forward to the cranium on the sides, tapering posteriorly and coming to a point inside the hollow interhæmal spine; stomach with 2 cæca, contents small crustacea. (Four stomachs examined.)

Color silvery, brownish above, paler below; back with dusky cross-bars, one on nape running downward and backward to upper angle of opercle, another just in front of spinous dorsal, running downward and backward, a third one across the last dorsal spines running downward and backward and meeting the second one just above the lateral line, a fourth bar running downward and forward crosses the back at about the middle of soft dorsal, the last one crosses the back just posterior to dorsal fin. There is a dusky blotch on dorsal surface of caudal peduncle, and a row of blotches along sides on median line of body; dorsal and caudal more or less dusky; spinous dorsal with black margin; other fins pale.

A lot of 100 specimens from Taboga Island, ranging in length from 55 to 100 mm., fits the above description. These have a very elongate body, which is little compressed and the back scarcely elevated. The anal spines are very small, especially the second one, which is only slightly stronger than the third. This lot seems to represent an extremely slender form of this very variable species, *Eucinostomus californiensis*.

425. Eucinostomus meeki Eigenmann.

Eucinostomus meeki Eigenmann, Bull. U. S. Fish Comm., XXII, 1902 (1904), 229 (San Juan River, western Cuba).

Gerres lefroyi Regan, Biol. Cent. Amer., Pisc., 1907, 39 (in part).

"General appearance of *Ulæma lefroyi*, differing from all other species of *Eucinostomus* in having but 2 anal spines.

"Head 3.25; depth 3; D. IX, 10; A. II, 8; scales 4-46-9; eye 1 in snout, 3 in head, 1 in interorbital. Body elongate, little compressed or elevated, the dorsal profile but little more elevated than the ventral; snout pointed, the profile from snout to dorsal gently arched; mouth narrow, terminal, but little above the lower margin of the eye; maxillary reaching to vertical from front of eye, 3.4 in head, its exposed part boat-shaped, a trifle more than twice as long as wide, 5 in head; intermaxillary groove entirely naked, its width 5 in the interorbital; preopercle and preorbital entire; dorsal spines slender, the second longest, 6 in the length; ventrals short, reaching half way to anal; pectorals long, 3.5 in the length, reaching beyond tips of ventrals, but not to vent. First anal spine minute, the second equal to the length of the eye.

"Color, ashy gray, with some metallic reflections; dusky lines along the rows of scales; sides and back everywhere punctate with minute dots; vertical fins dusky; ventrals and pectorals lighter." (Eigenmann.)

Not seen by us. The above description is a copy of the original.

Known only from Cuba.

160. Genus **Ulæma** Jordan & Evermann.

Ulæma Jordan & Evermann, in Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 471 (type *Diapterus lefroyi* Goode).

Body slender; preopercle and preorbital entire; fin spines small; anal with only two spines; second interhæmal spine short and bluntish, not hollow and not receiving the end of the air bladder.

426. **Ulæma lefroyi** (Goode).

Diapterus lefroyi Goode, Amer. Journ. Sci. & Arts, VIII, 1874, 123 (Bermudas).

Eucinostomus productus Poey, Enumeratio, 1875, 55 (Havana).

Eucinostomus lefroyi Goode, Bull. U. S. Nat. Mus., V, 1876, 39.

Ulæma lefroyi Jordan & Evermann, in Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 471; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1371; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 47.

Head 3.2 to 3.4; depth 2.95 to 3.3; D. IX, 10; A. II, 8; scales 46 to 49.

Body elongate, not very greatly compressed; back little elevated; anterior profile gently convex; snout 3 to 3.34 in head; eye 2.7 to 3.1; mouth rather small; maxillary reaching to or slightly past anterior margin of orbit; premaxillary groove narrow, and free from scales; preorbital and preopercle entire; gill-rakers small, 7 below angle on anterior arch; dorsal fin deeply notched, the spines weak and flexible; anal spines 2, the second rather strong, 3.45 to 3.84 in head; pectorals moderate, not quite reaching vertical from vent; ventrals short, not reaching more than half the distance from their base to anal opening.

Color silvery, darker above, everywhere with fine dusky punctulations, and traces of cross-bars; top of spinous dorsal black; dorsal, anal and caudal dusky; ventrals and pectorals paler, but with dusky punctulations; no distinct lines along the rows of scales on sides; snout dusky.

This species was not found on the coast of Panama. The above description is based on specimens from Key West, Nassau, Cozumel and Honduras.

Known from Florida south to Brazil.

161. Genus **Gerres** Cuvier.

Gerres Cuvier, in Quoy & Gaimard, in Freycinet, Voy. Uranie et Physicienne, Zoöl., 1824, 293 (type *Gerres vaigiensis* Quoy & Gaimard).

Xystæma Jordan & Evermann, in Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 471 (type *Mugil cinereus* Walbaum).

Preopercle entire; second interhæmal spine long and spear-shaped; second dorsal and second anal spines less enlarged than in *Diapterus*.

KEY TO THE SPECIES.

a. Body deep, the depth 2.25 to 2.6 in length; premaxillary groove broad; sides of body with dark cross-bars. *cinereus*, p. 589.

aa. Body slender, the depth 3 in length; premaxillary groove narrow, restricted anteriorly; sides without cross-bars. *havana*, p. 590.

427. **Gerres cinereus** (Walbaum).

Mugil cinereus Walbaum, Artedi Piscium, Pt. III, 1792, 228 (Bahamas; after Catesby).

Gerres aprion Cuvier, Règne Animal, Ed. II, II, 1829, 188 (based on Catesby).

Gerres zebra Müller & Troschel, in Schomburgk, Hist. Barbados, 1848, 668 (Barbados).

Gerres squamipinnis Günther, Cat. Fish. Brit. Mus., I, 1859, 349 (Jamaica; Guatemala), and Trans. Zoöl. Soc. London, VI, 1869, 391.

Gerres cinereus Jordan, Proc. U. S. Nat. Mus., 1885, 384.

Xystæma cinereum Jordan & Evermann, in Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 471; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1372, Pl. CCXVIII, fig. 556; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 114.

Gerres similimus Regan, Biol. Cent. Amer., Pisc., 1907, 38, Pl. VIII, fig. 2 (Rio Presidio, Mexico).

Head 2.75 to 3.8; depth 2.25 to 2.6; D. IX, 10; A. III, 7; scales 41 to 45.

Body elongate, compressed; back moderately elevated; anterior profile straight from tip of snout to occiput, evenly convex from occiput to origin of dorsal; snout 2.75 to 3.75 in head; eye 2.64 to 3.25; mouth moderate; maxillary extending from slightly past anterior margin of orbit to anterior margin of pupil; premaxillary groove broad and free from scales; preorbital and preopercle entire; gill-rakers small, 7 below angle on anterior arch; dorsal spines weak, the

second not much stronger than the third, and about equal to it in length; second anal spine a little shorter than the third, but very much stronger, 2.1 to 3.2 in head; pectorals reaching to or almost to origin of anal; ventrals usually not reaching to vent; caudal fin long, the upper lobe the longest, as long as or longer than the head, 2.25 to 2.8 in length of body, the entire fin covered with small scales; 4 or 4½ rows of scales between the lateral line and middle of dorsal; second interhæmal spine long and spear-shaped; air bladder cylindrical, with two anterior and two posterior appendages, the anterior ones extending forward to cranium on sides, the posterior ones reaching past interhæmal spines to about the base of the fourth soft ray of the anal; stomach with short and thick cæca, contents small molluscs. (Three stomachs examined.)

Color silvery, dark above, pale below; sides with broken vertical bars which are bluish in life, these often very faint; no dark lines along rows of scales; dorsal and caudal dusky; pectorals pale; ventrals and anal yellowish in life; snout dusky.

This species was found to be common on the Atlantic coast but rather rare on the Pacific coast. Our collection contains 35 specimens from the Atlantic and 5 from the Pacific, ranging in length from 110 to 310 mm. Besides these we have at hand for comparison the numerous specimens deposited in the U. S. National Museum collection. We are unable to detect any difference, whatever, between the Atlantic and Pacific representatives.

Known from the Atlantic coast from Florida south to Cartagena, and on the Pacific coast from Lower California south to Peru. Our Atlantic coast specimens are from Toro Point; Fox Bay, Colon; Colon Reef; Colon market; and Porto Bello. Pacific coast specimens are from Corozal; Panama City market; and Rio Juan Diaz, Juan Diaz.

428. **Gerres havana** (Nichols).

Xystæma havana Nichols, Bull. Amer. Mus. Nat. Hist., XXXI, 1912, 189 (Havana); Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 48.

This species was not seen by us. It apparently differs from *G. cinereus* in being more slender, in having the premaxillary groove narrower and of different shape, and having no dark cross-bars on sides of body.

Recorded from Havana, Cuba, and from Natal, Brazil.

162. Genus **Diapterus** Ranzani.

Diapterus Ranzani, Novi. Comment. Ac. Sci. Inst. Bonon., IV, 1840, 340 (type *Diapterus auratus* Ranzani).

Catochænum Cantor, Journ. Roy. Asiat. Soc. Bengal, XVIII, 1849, 55 (type *Gerres waigensis* Cuvier & Valenciennes, substituted for *Gerres,* which was regarded as preoccupied by *Gerris* Fabricius, 1794, a genus of insects).

Moharra Poey, Enumeratio, 1875, 50 (type *Gerres rhombeus* Cuvier).

Second interhæmal spine long and spear-shaped, not hollow and not receiving the end of the air bladder; preopercle serrate; body more or less rhomboid in form; the back elevated; the second or third dorsal and anal spines more or less elevated.

KEY TO THE SPECIES.

a. Preorbital entire; no distinct lines along the rows of scales on sides.

b. Anal spines 2, soft rays 9; body short and deep.

c. Gill-rakers 14 or 15 below angle on anterior arch; second anal spine strong, shorter than second dorsal spine, 4.5 to 5.9 in length of body. *rhombeus,* p. 593.

cc. Gill-rakers 10 below angle on anterior arch; second anal spine enlarged, almost as long as second dorsal spine, 3.5 to 3.8 in length of body. *evermanni* sp. nov., p. 594.

bb. Anal spines 3, soft rays 8.

d. Lateral line running high, everywhere much above axis of body, scales on anterior portion of body enlarged, becoming quite small on caudal peduncle; dorsal fins notched to the base, separate. *aureolus,* p. 594.

dd. Lateral line lower, in line with the axis of the body on caudal peduncle; scales anteriorly not much enlarged; dorsal fins not notched to the base, continuous.

e. Premaxillary groove narrow, free from scales in young, covered with small scales in larger specimens; gill-rakers 10 or 11, including rudiments, below angle on anterior arch; air bladder with one recurved posterior appendage, which is enlarged at its extremity, in adult, so as to form a bulb. *olisthostomus,* p. 595.

ee. Premaxillary groove broad and free from scales at all ages; gill-rakers 12 or 13, including rudiments, below angle on an-

terior arch; air bladder with two lateral posterior appendages, which extend backward on either side of interhæmal bones.
peruvianus, p. 597.

aa. Preorbital serrate; dark lines along the rows of scales on sides.

f. Body short and deep, the back much elevated; second anal spine much enlarged, longer than the third; gill-rakers 13 to 15 below angle on anterior arch.

g. Outer margin of dorsal very concave, anterior spines very high, the second as long or longer than the head, 2.25 to 3.4 in length of body.

h. Gill-rakers 13 or 14 below angle on anterior arch; scales rather large, 36 to 40 in lateral line; lateral stripes conspicuous.
plumieri, p. 598.

hh. Scales small, 43 to 45 in lateral line; lateral stripes faint.
mexicanus, p. 599.

gg. Outer margin of dorsal fin only feebly concave, the anterior spines only moderately elevated, the second always shorter than the head, 3.4 to 4.8 in length of body; gill-rakers 14 or 15 below angle on anterior arch. *axillaris*, p. 599.

ff. Body more elongate, the back only moderately elevated; second anal spine strong, equal to or shorter than third; gill-rakers 9 to 12 below angle on anterior arch.

i. Second anal spine very strong, and longer than the second dorsal spine; lower lip normal, not thickened.

j. The third row of scales below lateral line running the whole length of body; 9 rows of scales between lateral line and base of ventrals; gill-rakers 9 or 10. *brasilianus*, p. 600.

jj. The second row of scales below lateral line running the whole length of the body; 8 rows between lateral line and base of ventrals; gill-rakers 11 below angle on anterior arch.
lineatus, p. 602.

ii. Second anal spine strong, but not longer than second dorsal spine; lower lip more or less thickened, at least at sides.

k. Dorsal fin with 9 spines and 9 or 10 soft rays; 9 rows of scales between lateral line and base of ventrals; gill-rakers 10 or 11 below angle on anterior arch. *brevimanus*, p. 602.

kk. Dorsal with 10 spines, and 8 soft rays; 8 rows of scales between lateral line and base of ventrals; gill-rakers 12.
periche, p. 603.

429. Diapterus rhombeus (Guvier).

Gerres rhombeus Cuvier, Règne Animal, Ed. II, II, 1829, 188 (based on Sloane); Cuvier & Valenciennes, Hist. Nat. Poiss., VI, 1830, 459 (Martinique; San Domingo); Günther, Cat. Fish. Brit. Mus., I, 1859, 341; Evermann & Meek, Proc. Ac. Nat. Sci. Phila., 1886, 266; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1374; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 48; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 404 (Colon), and 1917, 133 (Colon).

Head 2.8 to 3.2; depth 1.8 to 2.25; D. IX, 10; A. II, 9; scales 38 to 40.

Body short and deep, much compressed, rhomboidal in form; the back much elevated; anterior profile very convex, with slight depression above orbits; snout 3.2 to 4.1 in head; eye 2.6 to 3.4; mouth rather large; maxillary reaching to about center of eye; premaxillary groove broad and free from scales; preorbital entire; preopercle serrate; gill-rakers rather short and very slender, 14 or 15 below low angle on first arch; second dorsal spine high, but little shorter than head; anal spines constantly 2 in number, the second very strong, but much shorter than second dorsal spine, 1.45 to 1.95 in head, 4.5 to 5.9 in length of body; pectorals long, nearly equal to length of head, reaching past origin of anal fin; first soft ray of ventral with a short filament, the fin reaching past anal opening; second interhæmal spine spear-shaped, longer than second anal spine, with a prominent ridge in front and a groove behind; air bladder cylindrical in shape, without appendages, ending abruptly both anteriorly and posteriorly; stomach with 3 finger-shaped cæca; contents of six stomachs examined—numerous small molluscs and crustacea, the remains of a partly digested fish, and plant tissue (algæ); peritoneum black.

Color silvery, darker above, with bluish reflections; small specimens often with faint dusky vertical bars on sides; pectorals pale; all other fins with dusky punctulations; spinous dorsal with black margin; ventrals and anal yellowish in life; snout dusky; no distinct lines along the rows of scales.

This species was found abundant on the Atlantic coast of Panama, and it runs far up brackish streams. A lot of 263 specimen, ranging in length from 55 to 175 mm., was preserved.

Known from the West Indies south to Brazil. Our specimens are from Toro Point; New Gatun; Mindi Cut; Fox Bay, Colon; Colon Reef; Colon market, and Porto Bello.

430. Diapterus evermanni sp. nov. (Plate LXIII.)

Type No. 81738, U. S. N. M.; length 78 mm.; Mindi River, near Mindi, Panama Canal Zone.

Head 2.8 to 2.9; depth 2 to 2.2; D. IX, 10 or 11; A. II, 9; scales 37 to 40.

Body short and deep, much compressed, rhomboidal in form; the back much elevated; anterior profile very convex, with a slight depression above orbits; snout 3.7 to 4.1 in head; eye 2.5 to 2.7; mouth rather small; maxillary reaching to about anterior margin of pupil; premaxillary groove broad, free from scales; preorbital entire; preopercle serrate; gill-rakers short and rather strong, 10 below angle on first arch; second dorsal spine elevated, somewhat shorter than head, 3.3 to 3.7 in length of body; second anal spine much enlarged, almost equal in length to second dorsal spine, 1.25 to 1.34 in head, 3.5 to 3.8 in length of body; pectorals nearly equal to length of head, reaching past origin of anal fin; first soft ray of ventrals with a short filament, fins reaching well past anal opening; second interhæmal spine spear-shaped; air bladder cylindrical in form, without appendages, ending abruptly both anteriorly and posteriorly; stomach with 5 cæca; contents of one stomach examined—partly digested crustacea and algæ(?); peritoneum black.

Color silvery, darker above, with bluish reflections; about 4 or 5 faint dusky vertical bars on sides; pectorals pale; all other fins with dusky punctulations; spinous dorsal with jet black margin; snout dusky; no distinct lines along the rows of scales.

This species differs from *Diapterus rhombeus* principally in having a larger second anal spine and in having fewer and stronger gill-rakers. It is represented in the present collection by 4 specimens, ranging in length from 70 to 95 mm. These were taken in the Mindi River near Mindi, and in Fox Bay, Colon.

431. Diapterus aureolus (Jordan & Gilbert).

Gerres aureolus Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 328 (Bay of Panama); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 114.

Head 3 to 3.24; depth 2.22 to 2.28; D. IX, 10; A. III, 8; scales 35 or 36.

Body compressed; the back moderately elevated, profile with an evident depression above orbits; snout 3.45 to 3.7 in head; eye 2.9 to 3.25; mouth large; maxillaries reaching to almost center of pupil; premaxillary groove broad and scaleless; preorbital entire; preopercle

serrate; gill-rakers very short, 12 or 13 in number; spinous dorsal not greatly elevated, spines slender, the second but slightly stronger than others, a little shorter than third, 1.6 to 1.9 in head; dorsal fins separate, notched to the base; caudal fin deeply forked, about as long as head, the lobes slightly rounded, not forming a sharp angle; anal spines low, the second a little shorter than the third (original description gives "second anal spine a little longer than third") but notably the stronger, 2.2 to 2.5 in head; ventrals reaching well past vent, more than half length of head; pectorals long, as long as head, reaching slightly past origin of anal; scales much enlarged anteriorly, becoming quite small on caudal peduncle, 2½ rows between lateral line and dorsal fin; lateral line running high, everywhere much above axis of body.

The color is described by Jordan and Gilbert (Bull. U. S. Fish Comm., I, 1881 (1882), 328) as follows:

"Color in life: Light olivaceous above, silvery below, sides with distinct tinge of pale yellow. Fins all yellowish; vertical fins margined with black, spinous dorsal with a jet-black blotch on tip of membrane of anterior spines. Membrane of each spine and ray of dorsal with a distinct jet-black spot at its base. Ventrals yellow on terminal portion of outer rays only, the very tips of these white. Tip of snout dark. Opercular membrane yellowish above. Lips with yellow." This description agrees very well with our specimens, except that only the spinous dorsal is margined with black; vertical fins otherwise with dark punctulations. Our largest specimen also has some dark punctulations on the ventrals.

This species, which heretofore was known only from the type taken by Dr. C. H. Gilbert at Panama in 1881, is represented in the present collection by 11 specimens, ranging in length from 80 to 145 mm.

Known from the coasts of Panama and Colombia. Our specimens are from Balboa and the Panama market.

432. Diapterus olisthostomus (Goode & Bean).

Gerres olisthostoma Goode & Bean, Proc. U. S. Nat. Mus., 1882, 423 (Indian River, Fla.).

Gerres olisthostomus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1376, Pl. CCXVIII, fig. 557; Evermann & Marsh, Bull. U. S. Fish Comm., XX, Pt. I, 1900 (1902), 209, fig. 62; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 49.

Head 2.84 to 3.28; depth 1.97 to 2.26; D. IX, 10; A. III, 8; scales 38 to 41.

Body short and very deep; anterior profile steep; snout 3.1 to 4 in head; eye 2.4 to 3.75; mouth rather large; maxillary reaching

slightly past anterior margin of pupil; preorbital entire; preopercle serrate; premaxillary groove narrow and free from scales in small specimens, broad and covered with small scales extending forward almost to nostrils in larger specimens (Specimens in the present collection that measure 150 mm. or less in length have the premaxillary groove narrow and free from scales, while all larger ones have it wider and covered with scales.); eye moderate, equal to snout in length in large specimens, longer than snout in young; gill-rakers small, 10 or 11, including rudiments, below angle on first arch; anterior spines of dorsal high, the second a little shorter than the third, but noticeably stronger, 3.2 to 4.25 in body; second anal spine shorter than the third, very strong, 3.45 to 5.85 in body; the margin of the dorsal and anal fins very concave, more so than in *Diapterus peruvianus,* its west coast relative; the posterior spines and the soft rays of the dorsal lower; pectorals slightly longer than head, reaching to or a little past origin of anal; first soft ray of ventral usually with a short filament, fin reaching to anal opening in large examples, past anal opening in young; second interhæmal spine large, spear-shaped, with a ridge in front and a groove behind; air bladder strictly adherent, cylindrical in shape, with a narrow tube at posterior end curving upward and forward just in front of the interhæmal spines and enlarged at its extremity to form a bulb lying just under the body wall between the anal opening and origin of anal fin; this tube not noticeably developed into a bulb at its extremity in small specimens; peritoneum black; stomach with 4 or 5 cæca; contents of two stomachs examined—crustacea, and the remains of an animal bearing hair-like spines.

Color silvery, olivaceous above, paler below; no dark stripes along the rows of scales; some of our smaller specimens with four or five faint dusky vertical bars on sides; large specimens with dusky punctulation on sides, but no trace of bars; spinous dorsal with black margin; all fins with dusky punctulations, except pectorals, which are pale with a faint dusky bar at base; anal and ventrals greenish yellow in life; snout dusky.

This species can readily be separated from *Diapterus peruvianus,* its nearest relative, by the narrow or scaled premaxillary groove, the more concave margin of the dorsal and anal fins, and the fewer gill-rakers. A much more striking character, however, is found in the air bladder which has but a single posterior appendage, while that of *D. peruvianus* has two posterior appendages.

Of this species 38 specimens, ranging in length from 75 to 300 mm., were preserved.

Known from Florida south to Brazil. Our specimens are from Toro Point; Mindi Cut; Mindi Reef; Fox Bay, Colon; Colon market, and Porto Bello.

433. Diapterus peruvianus (Cuvier & Valenciennes).

Gerres peruvianus Cuvier & Valenciennes, Hist. Nat. Poiss., VI, 1830, 467 (Payta, northern Peru); Evermann & Meek, Proc. Ac. Nat. Sci. Phila., 1886, 266; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 115; Starks, Proc. U. S. Nat. Mus., 1906, 792; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 118; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 410 (Panama).

Gerres brevirostris Sauvage, Bull. Soc. Philom. Paris, 7 sér., III, 1879, 208 (Rio Guayas, Ecuador).

Head 2.9 to 3.3; depth 1.9 to 2; D. IX, 10; A. III, 8; scales 37 to 40.

Body short and deep; anterior profile steep; snout 2.95 to 4 in head; eye 2.4 to 3.8; preorbital entire; preopercle serrate; mouth rather large; the maxillary reaching to near middle of eye; premaxillary groove broad and always free from scales; eye longer than snout in young, about equal in length in larger examples; gill-rakers small, 12 to 14, including rudiments, below angle on anterior arch; dorsal spines high, the second shorter than the third but noticeably stronger, 3.05 to 6.3 in body; second anal spine shorter than third, but very much stronger, 4 to 6 in body; margin of the dorsal and anal moderately concave, soft rays moderately elevated; caudal deeply forked, slightly longer than head in large examples, all fins proportionately longer in young; pectorals long, reaching slightly past origin of anal; ventrals reaching to anal opening in large examples, to origin of anal fin in young; second interhæmal spine large, spear-shaped, with a ridge in front and a groove behind; air bladder adherent, cylindrical, with two long, slender appendages at the posterior end that extend backward on either side of the interhæmal spines to last anal ray; stomach with 3 cæca, contents plant tissue and shells of molluscs.

Color silvery, without dark stripes or bars; large specimens with dusky punctulations on sides; all fins, except pectorals, with dusky punctulations; spinous dorsal with black margin; pectorals pale, with dusky bar at base; ventrals and anal yellowish in life; snout dusky.

Of this species 68 specimens, ranging from 80 to 300 mm. in length, were preserved.

Known from Mazatlan south to Peru. Our specimens are from Miraflores; Corozal; tide streams, Balboa; Panama Bay, Balboa; Panama City market, and Rio Juan Diaz. Ascending brackish streams.

434. Diapterus plumieri (Cuvier & Valenciennes).

Gerres plumieri Cuvier & Valenciennes, Hist. Nat. Poiss., VI, 1830, 452, Pl. CLXVII (Porto Rico; Antilles); Günther, Cat. Fish. Brit. Mus., I, 1859, 340; Evermann & Meek, Proc. Ac. Nat. Sci. Phila., 1886, 270; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1379; Regan, Biol. Cent. Amer., Pisc., 1907, 40; Jordan & Dickerson, Proc. U. S. Nat Mus., 1908, 15.

Gerres embryx Jordan & Starks, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1379 (Charleston, S. C.).

Head 3 to 3.4; depth 1.95 to 2.3; D. IX, 10; A. III, 8; scales 36 to 40.

Body short and deep; back much elevated; profile convex over nostrils, straight over eyes, very convex at nape; snout 3.2 to 4.3 in head; eye 2.4 to 3.1; mouth rather large; maxillary reaching from slightly past anterior margin of orbit to near middle of eye; premaxillary groove broad and free from scales; preorbital and preopercle serrate; gill-rakers 13 or 14 below angle on anterior arch; margin of vertical fins very concave; the anterior spines very much elevated; second dorsal spine enlarged, longer than the third, equal to or longer than the head, 2.25 to 3.4 in length of body; second anal spine much enlarged, longer than third, a little shorter than second dorsal spine, 2.8 to 4 in length of body; pectoral fins long, reaching to or slightly past origin of anal fin, 2.5 to 3.1 in length of body; first soft ray of ventrals with a short filament, fin rays reaching almost to first anal spine, 1 to 1.35 in head; first row of scales below lateral line anteriorly parallel with it, the third running the length of the body, 9 rows between lateral line and base of ventrals; second interhæmal spine spear-shaped, much enlarged; air bladder fusiform, tapering somewhat more posteriorly than anteriorly, with two lateral anterior appendages extending forward to cranium at sides; stomach with 3 small cæca, contents mostly algae(?) and a few pieces of broken shells of molluscs; peritoneum black (one stomach examined).

Color in life dark bluish green above, silvery below, conspicuous dark lines along the rows of scales on sides; dorsal and caudal dusky, anal and ventrals orange, sprinkled with dusky punctulations; pectorals pale, with little orange at base; dorsal with black margin; a dark supra-orbital spot; snout dusky.

This species was not found to be very abundant. It is represented by 13 specimens, ranging from 100 to 290 mm. in length.

The type of *D. embryx* was not seen by us. A study of our series, however, leads us to believe that *plumieri* and *embryx* are identical.

This identity has already been pointed out by Regan (Biol. Cent. Amer., 1907, p. 40); also by Jordan & Dickerson (Proc. U. S. Nat. Mus., 1908, p. 15). We, however, do not agree with these authors with respect to *brasilianus,* which we find to be distinct.

Known from Florida south to Panama. Our specimens are from Mindi Cut and Porto Bello.

435. Diapterus mexicanus (Steindachner).

Gerres mexicanus Steindachner, Verh. Zoöl.—Bot. Ges. Wien, XIII, 1863, 383 (Rio Teapa, Mex.).

"Head 4; depth 2½; scales (6-43 to 45*-12). Closely allied to *G. plumieri,* the body longer, the scales smaller, the second anal spine shorter, ⅝ length of second dorsal spine and 1½ in head; second dorsal spine nearly as long as head (much* stronger than third but not much higher, 3 in body); pectorals short, as long as head, 3⅔ in body, not reaching anal (4½ scales* in a series from fourth dorsal spine to lateral line, 6 series* between first dorsal spine and lateral line); preorbital and preopercle serrate. Color much as in *G. plumieri,* but paler. Rio Teapa, Mexico, 1 specimen known (Steindachner); not seen by us; apparently distinguished by the small scales.

"(*) These characters in parentheses, not in the original description, are given in a letter from Dr. Steindachner, date August 3, 1895."

The above description and note are copied from Jordan & Evermann (Bull. U. S. Nat. Mus., XLVII, 1898, 1380. This species was not seen by us.

436. Diapterus axillaris (Günther).

Gerres axillaris Günther, Proc. Zoöl. Soc. London, 1864, 152 (Chiapam).

Gerres lineatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1377 (in part).

Head 3 to 3.4; depth 1.9 to 2.1; D. IX, 10; A. III, 8; scales 36 to 38.

Body short and deep, much compressed; anterior profile steep, comparatively straight, a slight depression over orbits and gently convex from occiput to origin of dorsal; ventral profile only slightly convex anteriorly; snout 3.4 to 3.8 in head; eye 2.75 to 3.5; mouth but slightly elevated; gape horizontal; tip of upper lip below level of lower margin of eye; preorbital and preopercle serrate; gill-rakers 14 or 15 below angle on first arch; dorsal and anal spines moderately elevated; second dorsal spine stronger than third, equal in length, 3.4 to 4.8 in length of body; second anal spine strong, slightly longer than third, a little shorter than second dorsal spine, 4 to 5.2 in length of body; pectoral fins mod-

erately long, reaching to the vertical from a point about midway between anal opening and origin of anal fin, 2.6 to 3.1 in length of body; ventral fins reaching slightly past anal opening; first row of scales, below lateral line, anteriorly, parallel with it; third row running the length of body; 9 rows between lateral line and base of ventrals.

Color silvery, dark streaks along the rows of scales on sides; pectorals pale, other fins with more or less dusky; margin of dorsal black.

No specimens taken at Panama. Specimens in the U. S. Nat. Mus. collection are from the west coast of Mexico. A comparison of these specimens with two specimens from Lake Acapulco, the type locality of *D. lineatus,* reveals the fact that these are two separate and distinct species, and not identical as supposed by recent authors. *D. axillaris* differs from *D. lineatus* in having the body more compressed, the anterior profile steeper, the ventral outline straighter, the mouth elevated and the gape horizontal. The third row of scales below lateral line, instead of the second as in *D. lineatus,* runs the length of the body. There is also one more row of scales between the lateral line and the base of ventral fin and the gill-rakers are more numerous.

Its nearest relative is *D. brasilianus* from the east coast; from which it, however, differs in having a steeper anterior profile, and a straighter ventral outline, the mouth being lower and more nearly horizontal. Its gill-rakers are more numerous; the second anal spine is shorter than the second dorsal spine, whereas in *D. brasilianus* it is longer than the second dorsal spine.

Known from the west coast of Mexico. The above description is based on 5 specimens from Mazatlan, which range in length from 120 to 200 mm.

437. Diapterus brasilianus (Cuvier & Valenciennes).

Gerres brasilianus Cuvier & Valenciennes, Hist. Nat. Poiss., VI, 1830, 458 (Porto Rico; Brazil); Evermann & Meek, Proc. Ac. Nat. Sci. Phila., 1886, 268; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1378; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 48.

Gerres patao Poey, Memorias, II, 1861, 320 (Havana).

Gerres plumieri Regan, Biol. Cent. Amer., Pisc., 1907, 40 (in part); Jordan & Dickerson, Proc. U. S. Nat. Mus., 1908, 15 (in part).

Head 3.1 to 3.3; depth 1.85 to 2.05; D. IX, 10; A. III, 7 or 8; scales 38 to 40.

Body compressed; the back moderately elevated; anterior profile from tip of snout to occiput nearly straight, with slight depression over eyes, from occiput to origin of dorsal gently convex; ventral profile convex anteriorly; snout 2.9 to 3.6 in head; eye 3.1 to 3.6; the mouth elevated, of moderate size; maxillary reaching to or slightly past anterior margin of pupil; premaxillary groove broad and free from scales; preorbital and preopercle serrate; gill-rakers small, 9 to 10 below angle on first arch; vertical fins rather low, the sheath of scales at base very high; margin of dorsal feebly concave, the spines low, the second the strongest, a little shorter than the third, 4.65 to 5.3 in length of body; the second anal spine very strong, a little shorter than the third, but slightly longer than the second dorsal spine, 4.7 to 5.2 in length of body; pectorals rather short, reaching to point about midway between anal opening and origin of anal fin, 3.3 to 3.4 in length of body; ventral fins reaching somewhat past anal opening, slightly shorter than head; first row of scales below lateral line anteriorly parallel with it; the third row running the length of body; 9 rows of scales between the lateral line and base of ventrals.

Color silvery, with bluish reflections above; a conspicuous dark streak along each row of scales on sides; dorsal fin almost wholly black; pectorals pale; other fins dusky; a dark supraorbital blotch present; snout dusky.

One specimen, 280 mm. long, is the only one of this species taken by us. Two specimens, 170 and 210 mm. in length, from Cuba, belonging to the U. S. Nat. Mus. collection, have also been examined. One of these is the *Gerres patao* Poey. It agrees with the other specimens in all essentials.

This species differs from *Diapterus plumieri* in having lower vertical fins, the spines being much shorter. The second dorsal spine is shorter than the third, also shorter than the second anal spine. In *Diapterus plumieri* the second dorsal spine is longer than third, also noticeably longer than the second anal spine. The pectoral fins of *D. brasilianus* are also much shorter and the gill-rakers fewer. The dark stripes along the rows of scales are little less conspicuous.

It differs from *Diapterus lineatus* in that the third row of scales below the lateral line, instead of the second, runs the length of the body; there is one more row of scales between lateral line and base of pectorals; the dorsal and anal spines are shorter and comparatively weaker; the pectoral fins are much shorter; and the gill-rakers below angle on first arch are one or two fewer in number.

Known from Cuba to Brazil. Our specimen is from Porto Bello.

438. Diapterus lineatus (Humboldt & Valenciennes).

Smaris lineatus Humboldt & Valenciennes, in Humboldt & Bonpland, Rec. Observ., Zoöl., II, 1821, 185, Pl. XLVI (Acapulco).

Gerres lineatus Evermann & Meek, Proc. Ac. Nat. Sci. Phila., 1886, 269; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1377 (in part).

Head 3.1 to 3.25; depth 1.95 to 1.97; D. IX, 10; A. III, 8; scales 36 to 40.

Body moderately compressed; anterior profile from snout to occiput almost straight, with slight depression over eyes, convex from occiput to origin of dorsal; ventral profile convex anteriorly; the snout elevated, tip of upper lip on level with lower margin of orbit; snout 3.4 to 3.6 in head; eye 3 to 3.3; the gape oblique; mouth large; maxillary reaching to center of pupil; premaxillary groove broad and free from scales; preorbital and preopercle serrate; gill-rakers rather small, 11 below angle on first arch; dorsal and anal fins rather high, the sheath of scales at base rather low; spines very strong; second dorsal spine a little shorter than third, but much stronger, 4.25 to 4.5 in length of body; second anal spine very strong, a little shorter than the third, also stronger and slightly longer than the second dorsal spine, 4.15 to 4.25 in length of body; pectorals long, reaching to origin of anal, 2.7 to 2.84 in length of body; ventrals reaching to a point about midway between anal opening and origin of anal fin; first row of scales, below lateral line, anteriorly, parallel with it, extending back to vertical from anal opening, the second row running the length of the body, 8 rows between lateral line and base of ventrals.

Color silvery, a dark streak along the rows of scales on sides; dorsal and caudal more or less dusky; spinous dorsal with black margin.

No representatives of this species have been taken at Panama. In in U. S. Nat. Mus. collection are 2 specimens taken by Captain Dow in fresh water, Lake Acapulco, the type locality. The above description is based on these specimens. They are respectively 200 and 225 mm. in length.

Known from the west coast of Mexico to Colombia.

439. Diapterus brevimanus (Günther).

Gerres brevimanus Günther, Proc. Zoöl. Soc. London, 1864, 152 (Chiapam); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1377; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 115; Meek, Field Mus. Nat. Hist. Pub., Zoöl. Ser., X, 1914, 121.

Head 3 to 3.6; depth 2.2 to 2.5; D. IX, 9 or 10; A. III, 8; scales 39 or 40.

Body compressed; the back moderately elevated; profile straight from tip of snout to posterior margin of orbit, slightly convex above nostrils in young, from posterior margin of orbits to pectorals quite convex; snout 3 to 3.75 in head; eye 2.5 to 3.7; preorbital and preopercle serrate; mouth large; maxillary reaching from anterior one-fourth of eye in young to posterior one-fourth in large examples; lips much thickened, especially the lower one; snout blunt, projecting beyond the tip of lower jaw in large specimens; gill-rakers short, 10 or 11 below angle on first arch; spines of vertical fins rather low; second dorsal spine a little shorter than third, but much stronger, 1.1 to 1.35 in head; second anal spine very strong, equal to or a little shorter than third, equal to or shorter than second dorsal spine, 1.18 to 1.35 in head, 4.2 to 6 in length of body; pectorals short, scarcely reaching to vertical from anal opening, 1.12 to 1.35 in head; ventrals reaching to anal opening in large examples, to origin of anal fin in young; caudal deeply forked, the lobes of equal length, a little longer than head, contained 3 times in length of body; first row of scales below lateral line anteriorly parallel with it, 9 rows between lateral line and base of ventral.

Color grayish above, silvery below; conspicuous dark lines along the rows of scales on sides; spinous dorsal with black margin in young, the black extending downward to near base of fin in large examples; pectorals pale, with dusky bar at base; all other fins with few to many dusky punctulations.

It is represented in the present collection by 4 specimens, ranging in length from 60 to 265 mm.

This species is easily separated from related species by the short pectoral fins and the thickened lips.

Known from Chiapam, Guatemala, south to Panama. Our specimens are from the Rio Chame, Chame; and Rio Mamoni, Chepo. We have also examined several specimens from Jesus Maria, Costa Rica. It runs far up fresh water streams.

440. Diapterus periche (Evermann & Radcliffe).

Gerres periche Evermann & Radcliffe, Bull. U. S. Nat. Mus., XCV, 1917, 93, Pl. XVIII, fig. 3 (Tumbes, Peru).

Head 2.94; depth 2.2; D. X, 8; A. III, 8; scales 39.

Body compressed; the back elevated; anterior profile convex over snout, nearly straight over nostrils and eyes, very convex at nape; ventral profile anteriorly little convex; snout 2.8 in head; eye 3.6; the mouth slightly elevated, tip of upper lip below lower margin of orbit;

the gape almost horizontal; mouth rather large, the maxillary reaching to anterior margin of pupil; premaxillary groove broad and free from scales; preorbital and preopercle serrate; gill-rakers 12 below angle on anterior arch; outer margin of dorsal gently concave, the spines strong, the second the strongest, a little shorter than the third, 4.7 in length of body; outer margin of anal concave, spines moderate, the second very strong, a little shorter than third, also shorter than second dorsal spine, 5.7 in length of body; pectorals of moderate length, reaching to a point about midway between vent and first anal spine; ventrals reaching well past vent; first row of scales below the lateral line anteriorly parallel with it; the second and third rows meeting at vertical from first anal spine and continuing from there as one row; 8 rows between lateral line and base of ventrals.

Color in spirits silvery, darker above, paler below; conspicuous dark lines above the rows of scales on sides; pectorals pale; all other fins more or less dusky; spinous dorsal with black margin; snout dusky.

Here redescribed from the type and only specimen known, 265 mm. long, from Tumbes, Peru. It is most like *D. lineatus* from which it differs in the scaling below lateral line. It also has a much shorter second anal spine, shorter pectoral fins, one more dorsal spine, two fewer soft rays, and one more gill-raker below angle on first arch.

Family LVIII. Kyphosidæ.

The Rudder-fishes.

Body elongate or ovate, compressed; head rather short; mouth small or moderate; the outer teeth in the jaws incisor-like, no molars; teeth on vomer and palatines present or absent; opercle entire; gill-membranes free from the isthmus, the rakers rather long; gills 4, a slit behind the fouth; pseudobranchiæ well developed; scales small or moderate, usually present on entire body except snout, ctenoid or not; dorsal fin continuous or divided, with 10 to 15 spines; anal fin with 3 spines; ventrals thoracic, with I, 5 rays, an accessory scale at base; pectoral fins without spine. Intestinal canal long, usually with many pyloric cæca; air bladder present, usually with 2 posterior horns. A family of herbivorous fishes, feeding largely on algæ; most of the species are valued as food. Two genera are represented in the Panama collection.

KEY TO THE GENERA.

a. Body rather deep, ovate; each jaw with rather large incisors on outer margin; caudal fin broadly forked, the lobes not produced, and not much longer than head. *Kyphosus,* p. 605.

aa. Body elongate; each jaw with very small incisors on outer margin; caudal fin very deeply forked, the lobes produced, much longer than head. *Sectator,* p. 609.

163. Genus **Kyphosus** Lacépède.

Kyphosus Lacépède, Hist. Nat. Poiss., III, 1802, 114 (type *Kyphosus bigibbus* Lacépède).

Pimelepterus Lacépède, Hist. Nat. Poiss., IV, 1803, 429 (type *Pimelepterus bosquii* Lacépède).

Dorsuarius Lacépède, Hist. Nat. Poiss., V, 1803, 482 (type *Dorsuarius nigrescens* Lacépède).

Xyster Lacépède, Hist. Nat. Poiss., V, 1803, 484 (type *Xyster fuscus* Lacépède).

Body ovate or elongate; head short; snout blunt; mouth small; a row of incisors on each jaw and a narrow band of villiform teeth behind them; fine teeth on vomer, palatines and tongue; branchiostegals 7; gill-rakers rather long and slender; lateral line continuous, present on base of caudal; scales moderate or small, ctenoid, covering most of head, the vertical fins and sometimes most of the paired fins; pyloric cæca very numerous; dorsal fin long, continuous, the spines not graduated, depressible in a scaly groove, 11 in number; caudal fin forked; anal fin with 3 short spines, the soft portion similar to that of the dorsal; ventrals inserted behind pectorals. The Panama collection contains 3 species, 2 from the Pacific coast and 1 from the Atlantic.

KEY TO THE SPECIES.

a. Scales small, 76 to 80 oblique series below lateral line; dorsal fin with 14 rays; anal with 13 or 14 rays. *analogus,* p. 605.

aa. Scales moderate, 59 to 61 oblique series below lateral line; scales on base of caudal abruptly reduced in size; dorsal fin constantly with 13 rays; anal fin with 12 rays. *elegans,* p. 607.

aaa. Scales rather large, 55 to 57 oblique series below lateral line, scales on base of caudal fin not abruptly reduced in size; dorsal fin with 12 or 13 rays; anal fin with 11 rays. *sectatrix,* p. 608.

441. **Kyphosus analogus** (Gill).

Pimelepterus analogus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 245 (Cape San Lucas).

Kyphosus analogus Jordan, Proc. U. S. Nat. Mus., 1885, 380 (Mazatlan; Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1385.

Head 2.65 to 3.1; depth 2.2 to 2.4; D. XI, 14; A. III, 13 or 14; 70 to 80 transverse series of scales below lateral line.

Body rather deep, compressed; anterior profile evenly convex; head rather short, not longer than deep; snout rather blunt, its length 3.25 to 3.65 in head; eye 3 to 3.9; mouth small, terminal; maxillary reaching to or slightly past anterior margin of eye, 3 to 3.1 in head; teeth rather large, about 28 in upper jaw; gill-rakers rather long, about 15 on lower limb of first arch; lateral line complete, continued on base of caudal fin, its curvature concurrent with that of the back; scales ctenoid, present everywhere except on snout, reduced on back, head and chest; soft parts of vertical fins completely covered with small scales; dorsal fin with short stiff spines, the median ones the longest, scarcely equal to depth of caudal peduncle, the soft part low, all of the rays of about equal length, somewhat shorter than the longest spines; caudal fin forked, the lobes subequal, angulate; anal fin with 3 very short stiff spines, the soft portion similar to that of the dorsal, but slightly higher; ventral fins rather small, reaching vent in specimens 145 mm. in length, to origin of anal in very young; pectorals short, inserted in advance of base of ventrals, 1.4 to 1.7 in head.

Color in alcohol of a specimen 145 mm. in length, dark gray above, paler below; rows of scales on sides with pale stripes; vertical fins dark like the upper part of the body; ventral fins white at base, with dusky tips; pectoral fins dusky at base, elsewhere plain translucent. The young of 40 mm. and less in length are very dark, with elongate pale spots on sides, and the caudal fin is colorless.

We have 11 specimens of this species, ranging in length from 25 to 145 mm. This species is readily separated from *K. elegans* by the notably smaller scales and by the slightly longer dorsal and anal fins. In *K. elegans* there appear to be constantly 13 rays in the dorsal fin and 12 in the anal, while in the present species there are 14 rays in the dorsal and 13 or 14 in the anal. The elevation of the dorsal and anal fins, an alleged difference, appears to be a variable character, upon which too much reliance must not be placed.

Known from Guaymas to Cape San Lucas and from Clarion and Socorro Islands. This is the first authentic record of the species occurring in Panama, if Gilbert & Starks are correct in the assertion that all previous Panama records are referable to *K. elegans*. Our specimens are from Taboga Island and Chame Point. The Chame Point specimens were sent by Mr. Robert Tweedlie.

442. Kyphosus elegans (Peters). (Plate LXIV.)

Pimelepterus elegans Peters, Monatsb. k. Ak. Wiss. Berlin, 1869, 707 (Mazatlan).

Kyphosus elegans Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1387; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 116 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 118 (Acapulco; Toboguilla Island; Panama Bay).

Head 3 to 3.7; depth 1.95 to 2.3; D. XI, 13; A. III, 12; scales below lateral line 59 to 62.

Body rather deep, compressed; anterior profile convex, swollen between the eyes; head not longer than deep; snout moderate, its length 2.75 to 4 in head; eye 3 to 3.6; mouth rather small, the lower jaw slightly included; maxillary reaching to or a little past anterior margin of eye, 3 to 3.25 in head; teeth flattened, rather strong, about 38 in upper jaw; gill-rakers slender, 14 to 17 on the lower limb of first arch; lateral line extending on base of caudal fin, its curvature concurrent with that of the back; scales ctenoid, rather deep on sides, wanting on snout, abruptly reduced on base of caudal; soft fins all scaly in adult; dorsal fin long, the spines strong, the median ones longest, equal to or longer than depth of caudal peduncle, the soft part anteriorly slightly elevated, the longest rays equal in length to the longest spines; caudal fin broadly forked, the upper lobe slightly the longer, both lobes pointed; anal fin with 3 short strong spines, the soft portion similar to that of the dorsal, but higher; ventral fins moderate, failing to reach vent in adults, reaching to or somewhat past vent in young; pectoral fins rather short, inserted in advance of base of ventrals, 1.3 to 1.7 in head.

Color dark grayish brown above, paler below; rows of scales on sides with pale or bronze streaks; posterior margin of opercle black; fins colored like the body, except the ventrals which are mostly white. The young are very dark, with elongate pale spots on sides, which in this species are more numerous, larger and more distinct than in *K. analogus* of similar size.

This species is represented by 22 specimens, ranging in length from 12 to 340 mm. It is a common species on the Pacific coast of Panama and is frequently seen in the markets.

Known from Guaymas to the Galapagos Islands. Our specimens are from Taboga Island, Chame Point, Balboa and the Panama City market.

443. Kyphosus sectatrix (Linnæus). (Plate LXV.)

Perca saltatrix Linnæus, Syst. Nat., Ed. X, 1758, 293 (misprint for *sectatrix*).

Perca sectatrix Linnæus, Syst. Nat., Ed. XII, 1766, 486.

Chætodon cyprinaceous (Broussonet) Gmelin, Syst. Nat., I, Pt. III, 1788, 1269 (name only; tropical Atlantic).

Pimelepterus bosquii Lacépède, Hist. Nat. Poiss., IV, 1803, 429, Pl. IX, fig. 1 (South Carolina).

Pimelepterus boscii Cuvier & Valenciennes, Hist. Nat. Poiss., VII, 1831, 258, Pl. CLXXXVII.

Pimelepterus bosci var. *sicula* Döderlein, Natur. Sicil., III, 1883, 83 1831, 264 (locality unknown).

Pimelepterus bosci var *sicula* Döderlein, Natur. Sicil. III, 1883, 83 (Gulf of Palermo).

Cyphosus bosqui Jordan, Proc. U. S. Nat. Mus., 1884, 128.

Kyphosus sectatrix Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1387, Pl. CCXIX, fig. 559.

Head 3.5 to 3.6; depth 2 to 2.35; D. XI, 12 or 13; A. III, 11; scales below lateral line 55 to 57.

Body rather deep, compressed; anterior profile convex, somewhat swollen between the eyes; head about as long as deep; snout moderate, 2.75 in head; eye 3.3 to 3.8; mouth rather small, the lower jaw included; maxillary reaching nearly or quite to anterior margin of eye, 2.5 to 2.9 in head; teeth rather large, flattened, about 35 in upper jaw; gill-rakers slender, 16 or 17 on lower limb of first arch; lateral line extending on base of caudal fin, its curvature concurrent with that of the back; scales large, ctenoid, not abruptly reduced on base of caudal; soft fins all scaly in adult; dorsal fin long, the spines strong, the median ones the longest, equal to depth of caudal peduncle, the soft part little, if any, elevated anteriorly, the longest rays not longer than the median spines; caudal fin very broadly forked, the lobes subequal, not strongly pointed; anal fin with 3 short spines, the soft portion similar to that of the dorsal, but higher anteriorly; ventral fins failing to reach vent in specimens at hand; pectorals moderate, 1.5 to 1.6 in head.

Color of our largest specimen (315 mm.) in life dark brown above to pale brown below; sides with blue lines and purplish reflections; fins all dark brown, except the ventrals which are largely white.

We have 2 specimens, respectively 260 and 315 mm. in length, which we refer to this species. The affinities of the Atlantic coast species are, however, not well understood and we cannot be certain

of the identification of the specimens at hand. We have compared our specimens with others from North Carolina, Florida, Bermuda and Cuba. Unless there is much variation among individuals with respect to the depth of body, number of anal and dorsal rays, and the number of scales in a lateral series, there must occur on the Atlantic coast more than two species of this genus, the number recognized in current works. Our Atlantic specimens differ from the Pacific specimens, *K. elegans,* in the slightly larger scales which are not abruptly reduced on the base of caudal, and in that they have 11 instead of 12 rays in the anal fin. A second species, *K. incisor* (Cuvier & Valenciennes), from the Atlantic comes within the range of the present work, if Jordan & Evermann (Bull. U. S. Nat. Mus., XLVII, 1898, p. 1386) are correct in referring *K. flavoline* (Poey) to that species. We are, however, unable to define the species from descriptions and we have no specimens at hand. It appears to differ from *K. sectatrix* in the slightly longer dorsal, smaller scales and in color. It is also said to reach a much larger size, attaining a length of 3 feet. A close study of a large amount of material from the Atlantic would be very desirable.

This species, as here understood, ranges from Massachusetts south to the West Indies and is now for the first time recorded from Panama. It is also recorded from the Canary Islands and from the Mediterranean Sea. Our specimens are from Toro Point and Porto Bello.

164. Genus **Sectator** Jordan & Fesler.

Sectator Jordan & Fesler, Rept. U. S. Fish Comm., XVII, 1889-91 (1893), 536 (type *Pimelepterus ocyurus* Jordan & Gilbert).

Body elongate, compressed; head moderate; snout blunt; mouth small; maxillary scarcely reaching anterior margin of eye; teeth very small, the outer series incisors; caudal fin very deeply forked. Other characters as in *Kyphosus.* A single species; known only from Panama Bay.

444. **Sectator ocyurus** (Jordan & Gilbert).

Pimelepterus ocyurus Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 327 (Panama Bay).

Kyphosus ocyurus Jordan, Proc. U. S. Nat. Mus., 1885, 380.

Sectator ocyurus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1389; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 116 (Panama Bay).

Head 3.95 to 4.05; depth 2.65 to 3.15; D. XI, 15; A. III, 14; scales 78 to 81.

Body elongate, tapering, compressed; anterior profile gently convex, not greatly elevated; head moderate; snout short, blunt, 3.5 to 3.85 in head; eye 4 to 4.25; mouth rather small, terminal, slightly oblique; maxillary scarcely reaching anterior margin of eye, 3.6 to 3.9 in head; teeth small, flattened; gill-rakers long, about 20 on lower limb of first arch; lateral line continued on base of caudal fin; scales rather small, ctenoid, present everywhere except about the mouth; soft fins all scaly in the adult; dorsal fin very long, continuous, the spines rather slender, and more or less flexible, depressible in a groove, the median ones the longest, exceeding the length of the snout, the soft part low and densely scaled; caudal fin deeply forked, both lobes sharply pointed; anal fin with 3 spines, the soft portion similar to that of the dorsal; ventral fins small, reaching only about half the distance from their base to origin of anal; pectoral fins short, 1.55 to 1.7 in head.

Color light olive-brown above; pale below; a dark blue stripe along back from nape to base of upper lobe of caudal; another broad blue stripe from above base of pectoral to base of median caudal rays, this stripe broadened below with a more or less distinct golden stripe; head with a blue stripe from snout through upper margin of eye to upper angle of gill-openings, a second blue stripe from snout through lower margin of eye to margin of opercle; fins mostly yellow; ventral fins largely silvery; pectorals brownish on inner side, outside yellowish.

Three specimens, ranging from 250 to 270 mm. in length, were secured. Occasionally seen in the markets and valued as food.

Known only from Panama Bay. Our specimens were purchased in the Panama City market.

Family LIX. Sciænidæ.

The Croakers.

Body more or less compressed, usually moderately elongate, covered with rather thin scales; lateral line continuous, usually concurrent with the back and extending to tip of caudal fin; bones of the skull cavernous; chin usually with pores, sometimes with barbels; teeth in the jaws in one or more series; canines often present; no incisors or molars ever present; no teeth on the tongue, vomer, palatines or pterygoids; maxillary without supplemental bone; premaxil-

laries protractile, but not very movable; nostrils double; gills 4, a slit behind the fourth, the membranes separate, free from the isthmus; dorsal fin deeply notched, or divided into 2 fins; the soft dorsal long; anal fin with not more than 1 or 2 spines; ventral fins thoracic, I, 5, inserted below or somewhat behind the pectorals. Air bladder usually large, variously developed (wanting in *Menticirrhus*).

Most of the species of this family make a peculiar noise, supposed to be produced by forcing the air from the air bladder into one of the lateral horns. From this noise which they make they have received the name *Croakers*.

KEY TO THE GENERA.

a. Preopercular margin with bony serræ or at least with one or more spines.

b. Body elongate; the lower jaw with one or more barbels.

c. Lower jaw with a single thickish barbel at tip; anal spines 2. *Umbrina*, p. 613.

cc. Lower jaw with a row of small barbels on each side along the rami, not in a tuft at tip of chin. *Micropogon*, p. 616.

bb. Body less elongate; the lower jaw without barbels.

d. Head rather broad above, interorbital space wide; skull excessively cavernous, spongy to the touch. *Stellifer*, p. 619.

dd. Head narrower; the skull not very cavernous, not noticeably spongy to the touch.

e. Gill-rakers comparatively long and slender; preopercle with its lowermost spine directed abruptly downward.

f. Tip of lower jaw with 2 slender canines; preopercle with rather weak serræ; second anal spine small. *Elattarchus*, p. 628.

ff. Lower jaw without canines; preopercle strongly serrate; second anal spine moderate or large. *Bairdiella*, p. 629.

ee. Gill-rakers short and thick, the longest scarcely longer than the greatest diameter of the posterior nostril; preopercle with its lowermost spine not directed abruptly downward. *Ophioscion*, p. 636.

aa. Preopercular margin with a membranous border, never with bony serræ or spines.

g. Upper jaw with a pair of very large canines at tip, these usually curved inward and backward; one of them often obsolete.

h. Canines large, lance-shaped, widened and flattened toward the tip, then coming abruptly to a sharp point, with a cutting edge at sides, precisely like a lance. *Macrodon*, p. 646.

hh. Canine teeth not lance-shaped, tapering gradually from the base.

i. Anal fin long, not much shorter than the second dorsal, composed of 17 to 20 rays. *Isopisthus*, p. 650.

ii. Anal fin small, very much shorter than the second dorsal, composed of 8 to 11 rays. *Cynoscion*, p. 653.

gg. Upper jaw without large canines at tip; jaws usually without canines, rather small when present.

j. Lower jaw with one or more barbels.

k. Anal fin with a single weak spine; lower jaw with a single stoutish barbel at tip. *Menticirrhus*, p. 666.

kk. Anal fin constantly with 2 spines; lower jaw with a row of barbels on inner edge of the dentry bones and a tuft at the tip of chin. *Paralonchurus*, p. 671.

jj. Lower jaw without barbels.

l. Mouth rather small, wholly inferior, horizontal; the snout protruding.

m. Body oblong, the back much elevated anteriorly, tapering rapidly to caudal peduncle; second dorsal very long, composed of 38 to 41 rays. *Eques*, p. 676.

mm. Body moderately elongate, the back not greatly elevated anteriorly; second dorsal moderate, composed of 22 or 23 rays. *Sciæna*, p. 679.

ll. Mouth large, oblique, or even vertical; snout not protruding.

n. Mouth very oblique or vertical, the lower jaw much in advance of the upper.

o. Head wide; skull excessively cavernous, and spongy to touch; interorbital space very broad; eye small, 8 to 10 in head; second anal spine very small. *Nebris*, p. 680.

oo. Head compressed; skull firm; interorbital space rather narrow; eye large, 2.9 to 3.9 in head; second anal spine enlarged. *Larimus*, p. 683.

nn. Mouth less oblique, the lower jaw little, if at all, in advance of the upper.

p. Lower jaw with canines. *Odontoscion*, p. 688.

pp. Lower jaw without canines. *Corvula*, p. 691.

165. Genus **Umbrina** Cuvier.

Umbrina Cuvier, Règne Animal, Ed. I, II, 1817, 297 (type *Sciæna cirrhosa* Linnæus).

Body moderately elongate; the back more or less arched; head oblong; snout thick and produced beyond the mouth; mouth horizontal or nearly so; preopercle with a bony margin which is finely serrate; chin with a single short and thickish barbel; teeth in villiform bands, the outer ones in the upper jaw usually somewhat enlarged; first dorsal fin with 10 spines; anal fin with 2 spines, the second one more or less enlarged; caudal fin lunate or truncate; gill-rakers present, but short; air bladder well developed.

KEY TO THE SPECIES.

a. Body with about 9 cross-bands; no prominent streaks along the rows of scales on sides and back; eyes small, 3.8 to 4.65 in head. *coroides*, p. 613.

aa. Body without cross-bands; with prominent streaks along the rows of scales on sides and back; eye larger, not more than 3.8 in head.

b. Body deep, the depth 2.7 to 2.96 in the length; eye large, 2.85 to 3.2 in head; scales small, 7 rows between lateral line and first dorsal spine, 5 rows between base of pectoral and lateral line; second dorsal with 29 to 33 soft rays; anal fin with 8 soft rays, the first one the longest. *dorsalis*, p. 614.

bb. Body more elongate, the depth 3.2 to 3.45 in length; eye comparatively smaller, 3.25 to 3.8 in head; scales larger, 5 rows between lateral line and first dorsal spine, 4 rows between base of pectoral and lateral line; second dorsal with 26 to 29 soft rays; anal fin with 7 soft rays, the second ray the longest. *xanti*, p. 615.

445. Umbrina coroides Cuvier & Valenciennes.

Umbrina coroides Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 187, Pl. CXVII (Brazil); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1466; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 404 (Colon), and 1917, 133 (Colon).

Umbrina broussonnetii Günther, Cat. Fish. Brit. Mus., II, 1860, 277 (not of Cuvier & Valenciennes).

Head 3.34 to 3.6; depth 3.1 to 3.55; D. X-I, 24 to 25; A. II, 7; scales 46 to 50, counting transverse series above the lateral line.

Body rather stout, compressed; the back elevated; the anterior profile convex; ventral outline gently convex; head rather short, com-

pressed; snout long, projecting beyond the premaxillaries, its length 2.85 to 3.3 in head; eye 3.8 to 4.65; mouth moderate, inferior, horizontal, the maxillary reaching to about the middle of eye, 2.7 to 3.1 in head; teeth in the jaws in bands, none of them notably enlarged; pseudobranchiæ well developed; gill-rakers present, 5 or 6 on lower limb of anterior arch; preopercle with distinct denticulations on its bony edge; scales ctenoid; spinous dorsal rather high, the spines weak and flexible, the third one the longest; soft dorsal low, the anterior rays the longest; upper lobe of caudal fin acute and longer than the lower rounded lobe; anal fin small, the second spine enlarged, 2.28 to 2.7 in head, the second soft ray the longest, outer margin of fin convex; ventral fins rather small, not reaching to vent; pectoral fins short, not reaching tip of ventrals, 1.4 to 1.55 in head.

Color silvery, darker above; faint dark streaks along the rows of scales; sides with about 9 dark cross-bars; lower part of sides, from base of pectorals to base of caudal fin, with numerous dusky punctulations; the fins usually all more or less dusky; spinous dorsal with a black margin.

Of this species 4 specimens were taken during May in 1911, ranging in length from 160 to 220 mm. Although a close watch was maintained for this fish during the three months of our stay in 1912, it was not again seen.

This species is found in the West Indies and along the Atlantic coast from Florida to Brazil. Our specimens are from the Colon market.

446. Umbrina dorsalis Gill.

Umbrina dorsalis Gill, Proc. Ac. Nat. Sci. Phila., 1862, 257 (Cape San Lucas); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1469; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 133.

Head 3.1 to 3.5; depth 2.7 to 2.96; D. X-I, 29 to 33; A. II, 8; scales 58 to 63, counting transverse series above lateral line.

Body deep, compressed; the back elevated; anterior profile very convex over snout, almost straight from posterior nostrils to origin of first dorsal; ventral outline quite convex; head rather large, strongly compressed; the snout rather short, projecting only slightly beyond the premaxillaries, its length 3.6 to 4.1 in head; eye 2.85 to 3.2; mouth inferior, slightly oblique, rather large, the maxillary reaching slightly past posterior margin of pupil, 2.2 to 2.6 in head; eye large, much larger than in *U. xanti*; teeth in the jaws in bands, the outer ones in the upper jaw somewhat enlarged; gill-rakers short, from 6 to 9 on lower limb of anterior arch more or less developed; preopercle with teeth on its bony

margin; scales strongly ctenoid, rather small, 7 oblique rows of scales between the lateral line and first dorsal spine, 5 rows between the base of the pectoral and lateral line; spinous dorsal low, the spines weak and flexible, the margin convex, the tips of the anterior spines not reaching the tips of last spines when the fin is deflexed; second dorsal fin long and low, the anterior rays the highest; caudal fin truncate, the upper lobe acute and somewhat longer than the lower rounded lobe; anal fin short, the second spine enlarged, 1.95 to 2.35 in head, the first soft ray the longest, the outer margin of fin slightly concave; ventral fins rather long, not quite reaching vent; pectoral fin small, not reaching the tips of the ventrals, 1.45 to 1.55 in head.

Color greenish brown above, silvery below; conspicuous dark streaks along the rows of scales above and on sides; numerous dark punctulations along side, extending from below base of pectoral fin to lower rays of caudal fin; the fins all more or less dusky; lower fins creamy-reddish in life.

Of this rare species only one specimen, 140 mm. long, was taken. Here described from the type specimens from Cape San Lucas, which range from 80 to 100 mm. in length, and from the single specimen secured by us.

This species is found on the west coast of tropical America. It is recorded from Cape San Lucas, Mazatlan and Panama. Our specimen is from the Panama City market.

447. Umbrina xanti Gill.

Umbrina xanti Gill, Proc. Ac. Nat. Sci. Phila., 1862, 257 (Cape San Lucas); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1467; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 133.

Umbrina analis Günther, Trans. Zoöl. Soc. London, VI, 1869, 426 (Panama).

Head 3.5 to 3.7; depth 3.2 to 3.45; D. X-I, 26 to 29; A. II, 7; scales 54 to 67, counting transverse series above lateral line.

Body somewhat elongate, compressed; the back gently elevated; profile very convex over snout, little convex from posterior nostrils to first dorsal spine; ventral outline little convex; head rather small, compressed; snout long, projecting beyond the premaxillaries, its length 3.2 to 3.59 in head; eye 3.25 to 3.8; mouth rather small, inferior, nearly horizontal; the maxillary reaching but slightly past the anterior margin of the pupil, 2.7 to 2.85 in head; eye small, much smaller than in *U. dorsalis*; teeth in the jaws in bands, the outer ones in the upper jaw scarcely enlarged; pseudobranchiæ well developed; gill-rakers present, most developed in the young, 8 to 10 on lower limb of anterior arch;

preopercle with its bony edge serrate; scales ctenoid, 5 oblique rows between the lateral line and first dorsal spine, 4 rows between the base of pectoral and lateral line; spinous dorsal low, the spines weak and flexible, the outer margin not convex, anterior spines reaching slightly past tips of last spines when deflexed; soft dorsal long and low, the anterior rays the highest; caudal fin truncate, the upper lobe acute, the lower one rounded; anal fin very short, the second spine enlarged, 1.85 to 2.6 in head, the second soft ray the longest, the outer margin convex; ventral fins rather short, not nearly reaching the vent, especially in large examples; pectoral fins very short, not reaching tip of ventrals, 1.67 to 1.75 in head.

Color greenish brown above, silvery below; dark lines along the rows of scales on back and sides; dorsal fins and caudal more or less dusky; lower fins yellow in life.

Of this species 19 specimens, ranging from 65 to 100 mm. in length, were preserved.

Known from Cape San Lucas to Ecuador. Our specimens are from Chame Point, Taboga Island and Panama Bay, Balboa.

166. Genus **Micropogon** Cuvier & Valenciennes.

Micropogon Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 215 (type *Micropogon lineatus* Cuvier & Valenciennes = *Perca undulata* Linnæus).

Body moderately elongate, compressed; the back somewhat elevated; preopercle strongly serrate; teeth in the jaws in villiform bands, the outer row in the upper jaw more or less enlarged; lower jaw with a row of minute barbels on each side; gill-rakers short, thickish; spinous dorsal consisting of 10 or 11 stoutish spines; anal constantly with 2 spines, the second strong, of moderate length; lower pharyngeals narrow, separate, with sharp conical teeth.

KEY TO THE SPECIES.

a. Outer row of teeth in upper jaw little if at all enlarged; spots on scales above the lateral line forming continuous streaks.

b. Scales large, 5 or 6 in a vertical series between lateral line and anterior dorsal spines, 47 to 54 in a horizontal series above lateral line; dorsal rays X-I, 20 to 23. *altipinnis*, p. 617.

bb. Scales comparatively small, 6½ or 7 in a vertical series between lateral line and anterior dorsal spines; 68 to 78 in a horizontal series above lateral line; dorsal rays X-I, 27 to 29. *furnieri*, p. 618.

448. Micropogon altipinnis Günther.

Micropogon altipinnis Günther, Proc. Zoöl. Soc. London, 1864, 149 (San José and Chiapam, Guatemala); Jordan & Gilbert, Bull. U. S. Fish Comm., II, 1882 (1883), 111; Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 419; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 132; Starks, Proc. U. S. Nat. Mus., 1906, 796.

Head 3.15 to 3.55; depth 3.1 to 3.58; D. X-I, 20 to 23; A. II, 8; scales 5 or 6-47 to 54, counting transverse series above lateral line.

Body rather robust, moderately compressed; the back little elevated; profile from tip of snout to posterior nostrils very convex, almost straight from posterior nostrils to origin of dorsal; ventral outline moderately convex; head rather large, slightly compressed; snout long, projecting slightly beyond the premaxillaries, 2.75 to 3.65; eye 4.05 to 6.2 in head; mouth moderate, inferior, slightly oblique, the maxillary reaching about to anterior margin of pupil; teeth in the jaws in bands, the outer ones in the upper jaw scarcely enlarged; pseudobranchiæ present; gill-rakers rather short, 14 to 16, including rudiments, below angle on anterior arch; pyloric cæca 7; preopercle strongly serrate, with large teeth at its angle and smaller ones above these; scales large, ctenoid, apparently becoming smoother with age; dorsal spines large, ctenoid, apparently becoming smoother with age, 5 or 6 in a vertical series between the lateral line and anterior dorsal spines; dorsal spines rather high, the third and fourth the longest; soft dorsal of moderate length, with a low scaly sheath at base, the rays gradually decreasing in length posteriorly; caudal slightly double concave, the longest rays just below middle of fin; anal fin small, constantly with two spines, the second 2.45 to 4.25 in head, becoming proportionately shorter with age; ventral fins rather short, not reaching tips of pectorals, except in the young, the outer ray with a short filament; pectorals rather long, not quite reaching vent.

Color silvery, darker above; rows of scales above the lateral line with dark longitudinal streaks; besides these there are about 8 short oblique bars running upward and backward, crossing the arched portion of the lateral line; large examples with numerous dusky punctulations on side from base of pectorals to base of caudal.

This species is here described from our specimens from Panama, which range from 80 to 590 mm. in length. It was found not to be very abundant, as only 14 specimens were obtained.

Known from the Pacific coast of tropical America, from Chiapam south to Guayaquil. Our specimens are from Chame Point, Balboa, and the Panama City market.

449. Micropogon furnieri (Desmarest).

Umbrina furnieri Desmarest, Prem. Déc. Ichth., 1823, 22, Pl. II, fig. 3 (Havana).

?Micropogon argenteus Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 218 (Surinam).

Micropogon undulatus Poey, Syn. Pisc. Cub., 1868, 325 (not of Linnæus).

Micropogon fournieri Jordan, Proc. U. S. Nat. Mus., 1884, 37.

Micropogon furnieri Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 418.

Head 3.1 to 3.5; depth 3.2 to 3.55; D. X-I, 27 to 29; A. II, 9; scales 68 to 78, counting transverse series above lateral line.

Body rather robust, moderately compressed, the back elevated; profile very convex over snout, straight from posterior nostril to nape; ventral outline from snout to anal opening almost straight; head moderately compressed; snout long, projecting somewhat beyond the premaxillaries, 2.86 to 3.3; eye 4.05 to 5.5 in head; mouth rather large, inferior, almost horizontal; the maxillary reaching to anterior margin of eye in large examples, to or slightly past anterior margin of pupil in young; teeth in bands in the jaws, the outer ones little enlarged; pseudobranchiæ present; gill-rakers of moderate length, 12 to 15 below angle on anterior arch; pyloric cæca 7; preopercle serrate, the teeth at angle strong, diverging; scales rather small, ctenoid, 6½ to 7 rows in a vertical series between lateral line and anterior dorsal spines; spinous dorsal rather high, the third and fourth spines the highest, these of about equal length, the outer margin concave; soft dorsal long and low, with a low scaly sheath at base; caudal slightly double concave, the rays just below middle of fin the longest; anal fin small, constantly with two spines, the second 2.7 to 4.8 in head, decreasing proportionately in length with age; ventral fins reaching tips of pectorals in young, but much shorter in adult, the outer ray filamentous; pectorals rather long, reaching to or almost to anal opening.

Color silvery, darker above; rows of scales above lateral line with dark streaks; besides these about 8 or 9 short oblique bars, running upward and backward across the arched portion of the lateral line; sides from base of pectorals to base of caudal with dusky punctulations.

This species is here described from a series of 29 specimens from the Atlantic coast of Panama. These specimens vary in length from 135 to 315 mm. Nearly all of them were taken on coral reefs. *M. furnieri* is distinguished from *M. undulatus,* a more northern form, by the smaller preopercular serrations, by the fewer scales in a vertical series between the lateral line and anterior dorsal spines (*M. undulatus* has 8 or 9 and *M. furnieri* has 6½ or 7), and by a difference in the shape of the spinous dorsal. In *M. undulatus* the fourth and fifth spines are the longest and the outer margin of the fin is almost straight. In *M. furnieri* the third and fourth spines are the longest and the outer margin is notably concave.

This species ranges from the West Indies southward, probably to the coast of Argentina. Our specimens are from Mindi Reef; Fox Bay, Colon; Colon Reef, and Colon market.

167. Genus **Stellifer** Oken.

Les Stellifères Cuvier, Règne Animal, Ed. I, 1817, 283.

Stellifer (Cuvier) Oken, Isis, 1817, 1182 (type *Bodianus stellifer* Bloch).

Stelliferus Stark, Elem. Nat. Hist., I, 1828, 459 (type *Bodianus stellifer* Bloch).

Homoprion Holbrook, Ichth. South Carolina, Ed. I, 1855, 168 (type *Homoprion lanceolatus* Holbrook).

This genus is allied to *Bairdiella* and *Ophioscion,* from which it is distinguished by the remarkably cavernous construction of the bones of the skull, the septa being reduced to the thinness of the walls of honeycomb; skull usually broad and somewhat depressed between the eyes.

KEY TO THE SPECIES.

a. Preopercular margin with 1 or 2 spines only; interorbital space broad, 2.1 to 2.75 in length of head.

b. Mouth very oblique, large, terminal or nearly so; the premaxillaries anteriorly above level of lower margin of eye; maxillary 1.75 to 2 in head.

c. Preopercular margin with a membranous border and only one short, weak spine just above the angle; eye very large, 3.4 in head; teeth in jaws in narrow villiform bands, none of them especially enlarged; gill-rakers 17 or 18 below angle; D. XI-I, 19 or 20; A. II, 11. *zestocarus*, p. 620.

cc. Preopercular margin with two strong spines, the lower one directed downward and backward; eye smaller, 3.8 to 4.9 in head; teeth in the jaws in two series, the outer series in upper

jaw enlarged; gill-rakers numerous, 27 to 30 below angle; D. X-I or XI-I, 22 to 25; A. II, 9. *oscitans*, p. 621.

bb. Mouth almost horizontal, inferior; the snout protruding; the premaxillaries wholly below the level of the lower margin of eye; maxillary 2.4 to 2.7 in head; preopercular margin with two strong teeth, the lower one directed downward and forward. *fürthii*, p. 622.

aa. Preopercular margin with more than 2 spines; interorbital space narrower, 2.6 to 3.2 in head.

d. Mouth horizontal or nearly so, inferior; the snout protruding; the premaxillaries wholly below level of lower margin of eye; no knob at chin.

e. Gill-rakers long and slender, numerous, 18 to 21 below angle; preopercular teeth rather small, 5 or 6 in number; D. XI-I, 22 or 23; A. II, 8 or 9. *colonensis* sp. nov., p. 623.

ee. Gill-rakers shorter, 12 or 13 below angle; preopercular spines more numerous, 8 to 10; D. XIV-I, 19 to 21; A. II, 11. *illecebrosus*, p. 625.

dd. Mouth quite oblique, terminal; the snout not protruding; the premaxillaries anteriorly above level of lower margin of eye; a small knob at chin.

f. Preopercular margin with 3 diverging spines only; mouth large; maxillary reaching posterior margin of eye, 1.75 to 1.95 in head; eye large, 3.3 to 3.85 in head; D. XI-I, or XII-I, 19 or 20. *mindii* sp. nov., p. 626.

ff. Preopercular margin with 6 or 7 radiating spines; mouth small; maxillary reaching posterior margin of pupil, 2.25 to 2.4 in head; eye small, 4.4 to 4.75 in head; D. XI-I, or XII-I, 22 to 24. *ericymba*, p. 627.

450. Stellifer zestocarus Gilbert.

Stellifer zestocarus Gilbert, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1445 (Panama); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 129, Pl. XVIII, fig. 37.

Head 3.4 to 3.7; depth 2.95 to 3.1; D. XI-I, 19 or 20; A. II, 11; scales 4-46 to 48, counting transverse series above lateral line.

Body rather deep, compressed; the back moderately elevated; profile straight over eyes, gently convex from nape to first dorsal spine; ventral outline anteriorly strongly curved; head compressed, deeper than in related species, the bones cavernous; interorbital space rather wide, 2.4 to 2.7 in length of head; snout short, not projecting beyond

the premaxillaries, its length 4.25 to 4.5 in head; eye very large, 3.35 to 3.4 in head; mouth rather large, the gape oblique; the premaxillaries anteriorly about on level with middle of eye; maxillary not quite reaching vertical of posterior margin of eye, 1.8 to 2 in head; pores and slits on snout and lower jaw obsolete; chin with a small knob; preopercle with a wide membranous margin, with a single, short, blunt spine immediately above angle; teeth in the jaws in very narrow bands, none of them especially enlarged; gill-rakers long and slender, about 17 or 18 below angle; pseudobranchiæ small; scales thin, weakly ctenoid; vertical fins scaly; spinous dorsal moderately elevated, the spines rather weak, the second spine only slightly stronger than the third, much weaker than in related species, not more than ⅔ as long as the third; soft dorsal high, the longest rays not much shorter than the longest spines; caudal sublanceolate, the middle rays produced, only slightly shorter than head; anal spines rather weak, the second a little shorter than the anterior soft rays, 1.75 to 2 in head; ventrals moderate, the outer ray not produced into a filament that projects beyond the longest rays; pectorals reaching past tips of ventrals, as long as head.

Color grayish above, silvery below; snout and sides with dusky punctulations; fins all more or less dusky; all except the spinous dorsal and pectorals margined with black; upper margin of eye black, and a dusky blotch at upper anterior angle of opercle; lining of gill covers dusky.

Three specimens, varying from 130 to 155 mm. in length, were secured and they form the basis for the above description.

Apparently a rather rare species, known only from Panama Bay. Our specimens are from Panama Bay, Balboa.

451. Stellifer oscitans (Jordan & Gilbert).

Sciæna oscitans Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 312 (Panama).

Stelliferus oscitans Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 393.

Stellifer oscitans Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1440; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 127.

Head 3.5 to 3.7; depth 2.8 to 3.3; D. X-I or XI-I, 22 to 25; A. II, 9; scales 5-49 to 55, counting transverse series above lateral line.

Body robust, compressed; the back somewhat elevated; anterior profile almost straight; ventral outline rather strongly curved; head broad and heavy, flat above, the bones cavernous; interorbital space

wide, 2.1 to 2.4 in length of head; snout very blunt, scarcely projecting beyond the premaxillaries, 3.6 to 4.6; eye 3.8 to 4.9 in head; mouth large, the gape oblique, curved; the premaxillaries anteriorly on level with lower margin of pupil; maxillary reaching past posterior margin of eye, 1.75 to 1.85 in head; pores and slits on snout and lower jaw obscure; chin with a distinct knob; preopercular margin with two strong spines, the upper one directed backward, the lower one directed downward and backward; teeth in the lower jaw in two irregular series, those of upper jaw in two distinct series, the outer series enlarged; gill-rakers long and slender, about ¾ the diameter of eye, numerous, 27 to 30 below angle; pseudobranchiæ small; scales moderate, cycloid on head, elsewhere ctenoid; vertical fins covered with small scales; spinous dorsal rather low, second spine stronger, but much shorter than third, 1.85 to 3 in head (varying greatly in length with age); soft dorsal rather high, the longest rays only slightly shorter than longest dorsal spine; caudal fin rounded or sublanceolate, the middle rays produced, equal to length of head in young, becoming somewhat shorter than head in older examples; anal fin moderate, the second spine large, somewhat shorter than soft rays, 1.3 to 1.9 in head; ventrals moderate, the outer ray produced in a short filament; pectorals long, reaching past tip of ventrals to vent, as long as or slightly longer than head.

Color bluish gray above, silvery below; snout and sides with numerous dark punctulations; dorsals and caudal dusky; other fins with dusky punctulations; ventrals yellowish in life; soft dorsal and anal margined with black; lining of opercle dusky.

This species is here described from 9 specimens, ranging from 130 to 220 mm. in length. Three of these are of the present collection. The other six specimens are in the United States National Museum collection.

This species is known only from Panama Bay. Our specimens are from Panama Bay, Balboa and the Panama City market.

452. Stellifer fürthii (Steindachner).

Corvina fürthii Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXII), Ichth. Beitr., III, 1875, 26, Pl. III (Panama).

Sciæna fürthi Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 315.

Stelliferus fürthi Jordan & Eigenmann, Rept. U. S. Fish Comm., 1886 (1889), 393.

Stellifer furthi Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1441; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 127.

Head 3.5 to 3.9; depth 2.9 to 3.2; D. XI-I or XII-I, 22 to 25; A. II, 9 or 10; scales 4 or 5-46 to 53, counting transverse series above lateral line.

Body rather deep, compressed; the back elevated; anterior profile straight or slightly convex over orbits; ventral outline anteriorly evenly rounded; head low and wide, the bones little cavernous; interorbital space wide, 2.5 to 2.8 in head; snout blunt, projecting beyond the premaxillaries, 3.5 to 4.3; eye 3.7 to 4.5 in head; mouth moderate, inferior, little oblique; the premaxillaries about on level with lower margin of eye; maxillary reaching nearly to posterior margin of eye, 2.4 to 2.7 in head; pores and slits on snout evident; no distinct knob at symphysis of lower jaw; preopercular margin with two rather strong spines, the lower one directed downward and forward, the upper one directed backward and outward; teeth in the jaws in narrow villiform bands, the outer ones in upper jaw somewhat enlarged; gill-rakers long and slender, the longest about ⅔ diameter of eye, 19 to 22 below angle; pseudobranchiæ present; scales moderate, ctenoid; vertical fins closely scaled; spinous dorsal rather low, the second spine stronger than succeeding spines, but only about half the length of the third spine; soft dorsal moderately elevated, somewhat lower than the spinous dorsal; caudal fin sublanceolate or rounded, the middle rays the longest, about equal to pectorals in length; anal fin moderate, the second spine strong, but shorter than the soft rays, 1.75 to 2.4 in head; ventrals rather small, the outer ray filiform; pectorals rather long, reaching somewhat past tips of ventrals, as long as head; stomach with 3 cæca; air bladder horned, and with two small tubes extending from anterior horns to first anal spine, where the air bladder ends in a sharp point.

Color light gray above, lower parts of sides silvery, tinged with pinkish salmon; all fins light yellow; soft dorsal with a narrow black margin; opercular lining dusky.

Female specimens taken in February have the ovaries distended with eggs. This species is here described from 18 specimens, ranging in length from 140 to 190 mm.

Known only from the Pacific coast of Panama. Our specimens are from Balboa and the Panama City market.

453. Stellifer colonensis sp. nov. (Plate LXVI, fig. 1.)

Type No. 81729, U. S. N. M.; length 125 mm.; Mindi Reef, Mindi, Panama.

Head 3.1 to 3.35; depth 2.9 to 3.1; D. XI-I, 22 or 23; A. II, 8 or 9; scales 4 to 5-48 to 56.

Body rather robust, compressed; the back elevated; anterior profile straight over eyes, convex from nape to origin of dorsal; ventral outline but little curved; head short, rather low, the bones conspicuously cavernous; interorbital space not depressed, 2.8 to 3.1 in length of head; snout blunt, projecting slightly beyond the premaxillaries, its length 3.6 to 4.5 in head; eye 4. to 5.5; the mouth nearly horizontal; the premaxillaries wholly below level of lower margin of eye; maxillary reaching past vertical of posterior margin of eye, 2.2 to 2.45 in head; pores and slits on snout and lower jaw well developed; chin without distinct knob; preopercle with 5 or 6 short spines, the lower one directed downward and backward, the upper ones small; teeth in the jaws in villiform bands, the outer series in upper jaw enlarged; gill-rakers slender, about ⅔ diameter of eye, 18 to 21 below angle; pseudobranchiæ present, rather small; scales ctenoid; vertical fins moderately scaly; spinous dorsal low, the spines weak, the second stronger than the third, but not nearly as long, 2.5 to 3.3 in head; soft dorsal nearly as high as spinous dorsal, with a scaly sheath, composed of one row of scales at base; caudal fin rounded or sublanceolate, the middle ray the longest, equal in length to head in very small specimens, but notably shorter in larger examples, equal in length to pectorals; anal fin small, the second spine moderate, 1.85 to 2.4 in head; ventrals short, not reaching anal opening, except in very young, the outer ray produced in a slender filament; pectorals moderate, reaching to or slightly past vent, 1.1 to 1.2 in head; stomach with 3 cæca; air bladder with two horns anteriorly, connected with the main body of the bladder by a small tube, tapering posteriorly, coming to a sharp point just in advance of interhæmal spines.

Color uniform grayish above, silvery below; snout and sides with dusky punctulations; a blotch or streak at upper anterior angle of opercle; vertical fins all more or less dusky, with a narrow black border; ventrals and pectorals pale, the former with dusky tips; opercular lining with dusky punctulations; peritoneum silvery.

Of this species 42 specimens were preserved, ranging from 50 to 140 mm. in length. All were taken near the Atlantic terminus of the Canal, and most of them on coral reefs.

This species is related to *S. microps* and *S. naso*, which inhabit the coasts of Guiana and Brazil. It differs from the former in having a deeper body, a larger eye, larger mouth, narrower interorbital, narrower preorbital, in having the slits and pores on the mouth well developed, and in having the dorsal rays more numerous. From *S. naso*

it may be distinguished by the shorter head, deeper body, larger mouth, smaller eye, narrower interorbital, fewer teeth on preopercular margin, and in having more rays in both the dorsal and anal. A female 140 mm. long, taken in April, 1911, has the ovaries well distended with eggs.

454. Stellifer illecebrosus Gilbert.

Stellifer illecebrosus Gilbert, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1442 (Panama); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 128, Pl. XVIII, fig. 36.

Head 3.2 to 3.4; depth 2.9 to 3; D. XIV-I, 19 to 21; A. II, 11; scales 4-44 to 48, counting transverse series above lateral line.

Body rather strongly compressed; the back elevated; dorsal and ventral outlines about evenly curved; head rather low, slightly depressed over orbits; interorbital space 2.9 to 3.2 in length of head; snout blunt, projecting slightly beyond the premaxillaries, its length 3.4 to 4 in head; eye 4.15 to 5; mouth moderate, inferior, slightly oblique; maxillary extending to about vertical of posterior margin of pupil, 2.45 to 2.64 in head; slits and pores on snout and lower jaw well developed, no knob at symphysis of lower jaw; premaxillary wholly below level of lower margin of eye; bones of the head moderately cavernous; preopercular margin with from 8 to 10 spines, increasing in size toward the angle, the lower one directed downward and backward or abruptly downward; teeth in the jaws in villiform bands, the outer series in upper jaw enlarged; gill-rakers of moderate length, the longest a little more than half the diameter of the eye, 12 or 13 (including rudiments) below angle; pseudobranchiæ present, well developed; scales rather large, cycloid on head, elsewhere ctenoid; vertical fins closely scaled; spinous dorsal rather high, the second spine stronger than the third, but only about two-thirds as long, 2.1 to 3.1 in head; soft dorsal rather low, the rays decreasing in length posteriorly; caudal fin sublanceolate, the middle rays produced, but slightly shorter than head; anal fin rather long, the spines rather small, much shorter than the longest soft rays, the second 2.7 to 3.5 in head; fin spines apparently varying greatly, becoming comparatively much shorter with age; ventrals small, the outer ray filiform; pectorals long, reaching past tips of ventrals to or nearly to vent, 1.1 to 1.3 in head.

Color light grayish above, with silvery reflections; silvery below; snout and sides with numerous dark points; dorsal and upper rays of caudal dusky; lower rays of caudal, anal, ventrals and pectorals all yellowish; dorsals and anal with black margin; outer ray, the inner ray, and the tips of all the rays of ventrals white.

This species is here described from 4 specimens, ranging from 110 to 200 mm. in length. Dr. Gilbert and associates secured 3 specimens at Panama in 1896, and so far as the present authors know, these, together with the 4 taken by them, are all there are extant to date.

Known only from Panama Bay. Our specimens are from the Panama City market.

455. Stellifer mindii sp. nov. (Plate LXVI, fig. 2.)

Type No. 81730, U. S. N. M.; length 120 mm.; Mindi Reef, Mindi, Panama.

Head 3.15 to 3.3; depth 2.9 to 3.25; D. XI-I or XII-I, 19 or 20; A. II, 8 or 9; scales 5 or 6-52 to 56, counting transverse series above lateral line.

Body compressed, rather deep; the back little elevated; profile straight over eyes; ventral outline anteriorly more strongly curved than the dorsal outline; head rather deep, compressed; bones of the head notably cavernous; interorbital space not depressed, 2.6 to 2.9 in length of head; snout short, not projecting beyond the premaxillaries, its length 3.6 to 4.2 in head; eye 3.3 to 3.85; the mouth terminal, large, more oblique than in related species; maxillary reaching vertical of posterior margin of eye, 1.75 to 1.95 in head; premaxillaries anteriorly on level with lower margin of pupil; pores and slits on snout and lower jaw minute; chin with a small knob; preopercle with 3 diverging spines at angle, the lower one directed backward and downward; the serrations on the preopercular margin above these spines extremely small, visible only under the magnifying glass even in our largest specimens; teeth in the jaws in very narrow bands, none of them especially enlarged; gill-rakers long and slender, the longest about three-fourths as long as eye, numerous, 19 or 20 below angle; pseudobranchiæ very small; scales ctenoid; vertical fins scaly; spinous dorsal rather low, the second spine stronger than the third, but not nearly as long, only about two-thirds the length of third, 2.2 to 2.6 in head; soft dorsal only slightly lower than the spinous dorsal, the rays decreasing in length posteriorly; caudal fin lanceolate, the middle rays produced, about as long as head; anal rather small, the second spine strong, as long as the longest soft rays but not projecting beyond them, 1.5 to 1.8 in head; ventrals short, not reaching anal opening except in the very young, the outer ray with a very short filament, scarcely projecting beyond the longest rays; pectorals long, reaching past tips of ventrals, as long as head.

Color grayish above, silvery below; upper margin of eye black; a dark streak or blotch at upper anterior angle of opercle; fins all more or less dusky; dorsals and caudal with a narrow black margin; opercular lining with dusky punctulations.

This species is represented by 6 specimens, ranging from 60 to 120 mm. in length, in the present collection. One was taken in Fox Bay, and the others on a coral reef near Mindi. It is distinguished from related Atlantic species of this genus by the shorter snout, the oblique, terminal mouth, larger eye, and by the fewer and weaker teeth on the preopercular margin.

456. Stellifer ericymba (Jordan & Gilbert).

Sciæna ericymba Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 311 (Panama).

Stelliferus ericymba Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 394.

Stellifer ericymba Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1444; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 129.

Head 3.3 to 3.6; depth 2.8 to 3.1; D. XI-I or XII-I, 22 to 24; A. II, 9 or 10; scales 4-44 to 50, counting transverse series above lateral line.

Body comparatively deep and compressed; anterior profile slightly concave over back of eyes; ventral profile strongly convex; head rather low and wide, the bones cavernous; interorbital space 2.8 to 3.15 in length of head; snout bluntish, not projecting beyond the premaxillaries, its length 4.1 to 5 in head; eye 4.4 to 4.75; mouth oblique; premaxillaries on level with lower margin of pupil, rather large; maxillary reaching posterior margin of pupil, 2.25 to 2.4 in head; lower jaw included, with a knob at symphysis; pores and slits on snout obscure; preopercular margin with 6 or 7 radiating teeth, the lower one not directed downward or forward; teeth in jaws in bands, the outer series in upper jaw enlarged; gill-rakers long and slender, 18 to 20 below angle on anterior arch, equal to about two-thirds the diameter of the eye; pseudobranchiæ well developed; scales rather large, strongly ctenoid; vertical fins closely scaled; spinous dorsal moderately elevated, the second spine much stronger than the succeeding spines, the other spines very slender and flexible; soft dorsal low, the longest rays about two-thirds as long as the longest spines; caudal fin sublanceolate, the middle rays the longest, somewhat shorter than head; anal fin small, the second spine strong, as long as the soft rays, 1.8 to 2.3 in head; outer ray of ventrals with a filament; pectorals moderate, 1.1 to 1.4

in head; stomach with four cæca; air bladder with two anterior horns, tapering posteriorly and coming to a sharp point just underneath the skin in front of first anal spine.

Color bluish gray above, silvery below; everywhere with dark points; fins all dusky, the lower ones the darkest, all with numerous dark points; lower jaw black within, upper margin of premaxillary black; a dark blotch at upper anterior angle of opercle; lining of opercle dusky; peritoneum pale silvery.

A specimen taken on January 19, 1912, has the ovaries well distended with eggs. This species is here described from eight specimens, including three of the types. Our collection contains 5 specimens, ranging from 140 to 155 mm. in length.

Known only from Panama Bay. Our specimens are all from the Panama City market.

168. Genus **Elattarchus** Jordan & Evermann.

Elattarchus Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 397 (type *Odontoscion archidium* Jordan & Gilbert).

This genus differs from *Bairdiella* in the presence of slender canines, and from *Odontoscion* mainly in the serrate preopercle, which has a downward directed spine at the angle. The second anal spine is very small. Only one species is known.

457. Elattarchus archidium (Jordan & Gilbert).

Odontoscion archidium Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 317 (Panama).

Bairdiella archidium Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 386.

Elattarchus archidium Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 397; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1431; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 125.

Head 3.1 to 3.3; depth 3.4 to 3.8; D. X-I or XI-I, 24 to 27; A. II, 8; scales 8-52 to 62, counting transverse series above lateral line.

Body elongate, compressed; the back scarcely elevated; anterior profile with a slight depression over eyes; head compressed; the cheeks vertical, rather deep; interorbital space 3.4 to 3.8 in head; snout rather acute, its length 3.7 to 4.2 in head; eye 4.1 to 4.6; mouth large, terminal, oblique; the premaxillaries anteriorly on level with about middle of eye; maxillary reaching posterior margin of pupil, 2 to 2.15 in head; snout and chin with slits and pores little developed; chin with a small

knob; preopercular margin serrate, the teeth rather weak, becoming larger at angle, the lowest tooth strongest, directed downward; gill-rakers long and slender, 12 to 14 on lower limb of anterior arch; pseudobranchiæ well developed; teeth in the jaws not in villiform bands, those of upper jaw in two series, the outer series enlarged; lower jaw with a single series of slender pointed teeth; tip of lower jaw with two slender canines; scales ctenoid; lateral line almost straight; the spinous dorsal moderately elevated, consisting of slender, flexible spines, the fourth the longest, 1.65 to 2 in head; second dorsal low; caudal fin truncate, both lobes angulate; anal fin very small, the second spine little enlarged, 2.4 to 2.9 in head; ventral fin short, not nearly reaching vent; pectorals short, not reaching tips of ventrals; vertical fins with scales on membranes extending more than half way up on fins.

Color bluish gray above, silvery below; rows of scales with lengthwise streaks; sides and snout with dusky punctulations; a dark blotch on opercle above, upper part of axil black; iris bright yellow; spinous dorsal dusky with black tip; other fins mostly pale, with more or less dusky.

This species is here described from 10 specimens from Panama. The present collection contains six specimens, ranging from 160 to 200 mm. in length.

Known from San Juan Lagoon, near Guaymas, south to Ecuador. Our specimens are from the Panama City market.

169. Genus **Bairdiella** Gill.

Bairdiella Gill, Proc. Ac. Nat. Sci. Phila., 1861, 33 (type *Bodianus argyroleucus* Mitchill = *Dipterodon chrysurus* Lacépède).

Skull little cavernous; teeth small, in few rows; gill-rakers slender; preopercular margin strongly serrate, the lower spine plectroid.

KEY TO THE SPECIES.

a. Second anal spine not greatly enlarged, not reaching past tips of posterior rays of fin when deflexed, and not nearly reaching base of caudal, 1.9 to 2.25 in head.

b. Coloration dark; fins all black or dusky; head wide, scarcely compressed; interorbital space 3.2 to 3.5 in head.
chrysoleuca, p. 630.

aa. Second anal spine much enlarged, reaching much past tips of posterior rays of fin when deflexed, usually reaching nearly to base of caudal, 1.25 to 1.75 in head.

c. Head short, compressed, 3.5 to 3.7 in length in specimens ranging from 190 to 285 mm. in length; eye very large, 3.4 to 3.7 in head; mouth very oblique, terminal, in advance of the short snout; the premaxillaries anteriorly on or above the level of the lower margin of the pupil; second anal spine very much enlarged, reaching base of caudal. *ensifera*, p. 632.

cc. Head longer, 3.2 to 3.5 in length in specimens ranging from 190 to 285 mm. in length; eye smaller, 3.9 to 4.5 in head; mouth less oblique or almost horizontal, inferior or subinferior; premaxillaries anteriorly below level of lower margin of pupil; second anal spine somewhat shorter, not quite reaching base of caudal.

d. Mouth horizontal, or nearly so, inferior; the snout projecting; premaxillaries anteriorly much below level of lower margin of eye; dorsal spines strong, the second not notably stronger than the rest; gill-rakers rather few, 10 to 12 on lower limb of anterior arch. *armata*, p. 633.

dd. Mouth more oblique; the snout scarcely protruding; the premaxillaries anteriorly about on level with lower margin of eye; dorsal spines weaker, more or less flexible; gill-rakers more numerous, 13 to 17 on lower limb of anterior arch. *ronchus*, p. 634.

458. Bairdiella chrysoleuca (Günther).

Corvina chrysoleuca Günther, Trans. Zoöl. Soc. London, VI, 1869, 427, Pl. LXVII, fig. 1 (Panama).

Sciæna aluta Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 232 (La Union, El Salvador).

Sciæna chrysoleuca Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 316.

Bairdiella chrysoleuca Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 389; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 127; Starks, Proc. U. S. Nat. Mus., 1906, 793.

Bairdiella aluta Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 389.

Head 3.2 to 3.4; depth 2.9 to 3.1; D. X-I, 21 to 23; A. II, 6 to 9; scales 5-51 to 57, counting transverse series above lateral line.

Body somewhat elongate, compressed; the back moderately elevated; profile from anterior nostrils to nape straight or slightly concave; ventral outline rounded; head robust, almost as wide as high at eyes;

interorbital space wide, 3.2 to 3.5 in head; snout blunt, projecting slightly beyond premaxillaries, its length 3.7 to 4.2 in head; eye 4.5 to 5.15; mouth slightly oblique; the premaxillaries anteriorly wholly below level of lower margin of eye; maxillary reaching to about posterior margin of pupil, 2.3 to 2.6 in head, lower jaw included; slits and pores on snout and chin evident; preopercular margin strongly serrate, the tooth at the angle and those below it enlarged, and usually directed downward; teeth in the jaws in villiform bands, the outer ones in upper jaw somewhat enlarged, those of lower jaw of uniform size; gill-rakers rather short and slender, 12 or 13 on lower limb of anterior arch; pseudobranchiæ large; scales strongly ctenoid; vertical fins scaly; first dorsal rather low, the first two spines strong, the rest more or less flexible, the third the longest, 1.75 to 2 in head; second dorsal moderate, the rays decreasing in length posteriorly; the caudal fin slightly double truncate or rounded, the upper lobe more or less angulate, the lower one rounded, the middle rays the longest, equal to distance from snout to preopercular margin in our smallest examples, somewhat shorter in our larger ones; anal variable, the second spine strong but rather short, 1.9 to 2.25 in head; ventrals rather short, the outer ray produced into a filament, sometimes almost reaching anal opening; pectorals rather long, reaching past tips of ventrals, 1.1 to 1.28 in head.

Color brownish, with silvery intermixed, often scarcely paler below than above; body almost everywhere sprinkled with brown dots; some specimens with distinct dark streaks along the rows of scales on sides and back, these obscure in others; fins all very dark or dusky.

Our collection contains 4 specimens, ranging from 225 to 305 mm. in length. Besides these we have examined a specimen from Guayaquil, Ecuador. We find a great deal of individual variation and we therefore here include *B. aluta*, which has been known only from the type, a specimen 240 mm. in length, from La Union, El Salvador, and which was evidently destroyed in the Indiana University fire. It was said to differ from the present species in having a larger eye, fewer scales and fewer rays in the dorsal and anal fins. Our series covers these variations with the exception of the fin ray count of the dorsal and the size of the eye, which was said to be "about 4 in head." Counting the transverse series of scales below the lateral line, we get a variation of from 44 to 51 in the specimens before us.

Known from the Pacific coast of tropical America from La Union, El Salvador, south to Guayaquil, Ecuador. Our specimens are from Panama Bay, Balboa and the Panama City market.

459. Bairdiella ensifera (Jordan & Gilbert).

Sciæna ensifera Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 313 (Panama; Punta Arenas).

Corvina fulgens Vaillant & Bocourt, Miss. Sci. Méx., etc., Pt. IV, 1883, 164, Pl. VI, figs. 2, 2a, 2b, 2c, 2d (La Union, Mexico).

Bairdiella ensifera Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 387; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 126.

Head 3.5 to 3.7; depth 2.8 to 3.2; D. X-I, 22 to 24; A. II, 8 or 9; scales 8-58 to 66, counting transverse series above lateral line.

Body compressed, moderately elongate; the back elevated; anterior profile with a slight depression over the eyes; ventral outline anteriorly strongly rounded; head compressed, the interorbital space rather narrow, 4 to 4.65 in length of head; snout short, not projecting beyond the premaxillaries, its length 4.3 to 4.7 in head; eye 3.3 to 3.7; preorbital very narrow, about the width of the pupil; mouth very oblique; the premaxillaries anteriorly on level of middle to upper margin of pupil; maxillary reaching from middle of eye to slightly past posterior margin of pupil, 2.1 to 2.3 in head; pores and slits on snout and chin evident; preopercular margin strongly serrate, the teeth at angle enlarged, diverging, the lower one directed downward and forward; teeth in the jaws in few series, the outer ones in the upper jaw and the inner ones in the lower jaw somewhat enlarged; gill-rakers long and rather slender, 15 or 16 on lower limb of anterior arch; pseudobranchiæ present; scales ctenoid; spinous dorsal rather high, the spines rather strong, the second one strong, but scarcely half as long as the third, the fourth the longest, 1.45 to 1.75 in head; soft dorsal moderately scaly at base, the rays decreasing rapidly in length posteriorly; caudal truncate, the upper lobe angulate, the lower one slightly rounded, the middle rays scarcely longer than those of upper lobe; anal fin rather large, the second spine very long and strong, reaching to or very nearly to base of caudal when deflexed, 1.25 to 1.38 in head; ventrals very long, usually reaching almost to vent; pectorals short, not reaching tips of ventrals, 1.2 to 1.3 in head.

Color bluish gray above, silvery below; a black axillary spot and a bluish blotch at upper anterior angle of opercle; sides and snout with dusky punctulations; spinous dorsal blackish; soft dorsal and caudal dusky yellow, with black margin; anal with base and anterior rays yellow, sometimes also with dusky punctulations, tips of posterior rays white; ventrals and pectorals yellowish.

Of this species 6 specimens were preserved, ranging from 195 to 265 mm. in length. It may be separated from *B. icistia,* which is known from the west coast of Mexico and which it resembles, by the more oblique mouth, fewer dorsal rays, stronger dorsal spines and by the longer second anal spine.

Known from the Pacific coast of tropical America, from La Union, Mexico, south to Guayaquil, Ecuador. Our specimens are from Panama Bay, Balboa, and the Panama City market.

460. Bairdiella armata Gill. (Plate LXVII, fig. 1.)

Bairdiella armata Gill, Proc. Ac. Nat. Sci. Phila., 1863, 164 (west coast of Central America); Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 388 (in part, not of Gill); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1436; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 126.

Corvina armata Günther, Trans. Zoöl. Soc. London, VI, 1869, 428.

Corvina acutirostris Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXII) Ichth. Beitr., III, 1875, 28, Pl. IV (Panama).

Bairdiella ronchus Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 410 (Panama; not of Cuvier & Valenciennes).

Head 3.2 to 3.4; depth 2.75 to 3.1; D. X-I, 21 to 23; A. II, 9; scales 6-52 to 60, counting transverse series above lateral line.

Body compressed; the back elevated; the anterior profile steep, straight from snout to nape; ventral outline anteriorly straight; head compressed; the interorbital space slightly wider than eye, 4 to 4.75 in length of head; snout low and sharp, projecting somewhat beyond the premaxillaries, its length 3.65 to 4 in head; eye 3.65 to 4.2; mouth rather large, horizontal; the premaxillaries anteriorly wholly below the level of the lower margin of eye; maxillary reaching to or slightly past posterior margin of pupil, 2.4 to 2.8 in head; pores and slits on snout and lower jaw well developed; preopercular margin strongly serrate, the spines strongest at angle, the lower one directed downward and forward; teeth in the jaws in bands, the outer ones in upper jaw and the inner ones in lower jaw somewhat enlarged (In some specimens the teeth in lower jaw are of uniform size); gill-rakers rather long and slender, rather few in number, 10 or 12 on lower limb of anterior arch; pseudobranchiæ present; scales ctenoid; stomach with 5 cæca, contents mainly crustacea; air bladder with 2 anterior horns, ending in a sharp point posteriorly; vertical fins more or less scaly; spinous dorsal moderately elevated, the spines all strong, the anterior ones not notably stronger than the rest; soft

dorsal moderate, the rays decreasing in length posteriorly; caudal fin truncate, the upper lobe slightly angulate, the lower rounded, the middle rays slightly produced; anal rather large, the second spine very much enlarged, but not reaching past tips of longest rays, nearly reaching base of caudal when deflexed, 1.3 to 1.65 in head; ventrals long, reaching to or nearly to anal opening; pectorals rather short, not reaching tip of ventrals, 1.3 to 1.45 in head.

Color bluish gray above, silvery below; sides with dusky punctulations; fins all yellowish; ventrals, pectorals and caudal orange; tips of spinous dorsal black; soft dorsal and caudal with a dark margin; peritoneum silvery.

Our collection contains 4 specimens, ranging from 150 to 225 mm. in length. The above description is based on these and on several specimens from the United States National Museum collection.

This species is found on the Pacific coast of tropical America, from Lower California south to Panama. Our specimens are from Panama Bay, Balboa.

461. Bairdiella ronchus (Cuvier & Valenciennes). (Plate LXVII, fig. 2.)

Corvina ronchus Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 107 (Maracaibo; Surinam).

Bairdiella ronchus Poey, Syn. Pisc. Cub., 1868, 334; Fowler, Proc. Ac. Nat. Sci. Phila., 1917, 133 (Colon).

Corvina (Homoprion) acutirostris Steindachner, Denkschr. Ak. Wiss. Wien, XLI, 1878, 9.

Sciæna ronchus Jordan, Proc. U. S. Nat. Mus., 1886, 44.

Bairdiella armata Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 388 (in part).

Bairdiella veræ-crucis Jordan & Dickerson, Proc. U. S. Nat. Mus., 1908, 16, fig. 1 (Vera Cruz).

Head 3.2 to 3.5; depth 2.8 to 3.5; D. X-I, 22 to 25; A. II, 8 or 9; scales 7-54 to 66, counting transverse series above lateral line.

Body oblong, compressed; the back elevated; anterior profile gently convex in young, becoming concave over eyes in large examples; ventral outline anteriorly rounded; head compressed; the interorbital space somewhat wider than eye, 3.8 to 4.6 in length of head; snout short and rather blunt, usually projecting slightly beyond premaxillaries, its length 3.65 to 4.2 in head; eye 3.3 to 4.7; mouth rather large, somewhat oblique; the premaxillaries anteriorly on level with lower margin of eye; maxillary reaching about to posterior margin of pupil,

2.1 to 2.5 in head; pores and slits on snout and lower jaw evident; preopercular margin strongly serrate, the teeth becoming stronger at angle, the lower one directed downward; teeth in the jaws in bands, the outer ones in upper jaw and the inner ones in lower jaw enlarged; band in the lower jaw varying somewhat in width, often becoming very narrow at sides, but the teeth never in two distinct rows; gill-rakers rather slender, 13 to 16 developed on lower limb of first arch; pseudobranchiæ present; scales ctenoid; stomach with 4 cæca; air bladder with 2 horns anteriorly, tapering posteriorly, coming to a sharp point just underneath skin in front of first anal spine; vertical fins somewhat scaly; the spinous dorsal moderately elevated, the first and second spine, and sometimes the third, stronger than the succeeding flexible spines, the fourth spine the longest, 1.6 to 2.4 in head; soft dorsal rather high, the rays decreasing in length posteriorly; caudal truncate, the upper lobe with acute angle, the lower lobe rounded, the middle rays slightly the longest; anal fin rather large, the second spine very much enlarged, but not projecting beyond the longest rays, not quite reaching base of caudal when deflexed, 1.28 to 1.6 in head; ventrals long; the pectorals rather short, not reaching past tip of ventrals, 1.25 to 1.5 in head.

Color grayish above, silvery below; sides usually with brownish punctulations; a dark blotch on upper anterior angle of opercle; dorsals and caudal dusky, with a narrow black margin; anal with numerous dusky punctulations; ventrals and pectorals pale; opercular lining silvery, with few dark points; peritoneum silvery.

This species was found common on the Atlantic coast of Panama; 67 specimens, ranging from 90 to 285 mm. in length were preserved. A study of this large series, along with numerous specimens in the United States National Museum from the West Indies, coast of Mexico and Brazil, leaves no doubt of the identity of *B. ronchus* and the *B armata* of the Atlantic recently separated from the *B. armata* of the Pacific and placed under the name *B. veræ-crucis* Jordan & Dickerson (Proc. U. S. Nat. Mus., 1908, 16, fig. 1). There is considerable variation among individuals with respect to dentition, length of snout, size of eye, and with respect to dorsal and anal spines, but we find no constant differences. *B. ronchus* differs from *B. armata* of the Pacific coast in having a more oblique mouth, a blunter snout, a more rounded ventral outline, weaker dorsal spines, and in having the gill-rakers more numerous on the lower limb of the anterior arch. This species is readily distinguished from the more northern form, *B. chrysura*, by the enlarged second anal spine.

Known from the West Indies, coast of Mexico, and south to Brazil. Our specimens are from Mindi Cut, Mindi Reef, Colon market and Porto Bello.

170. Genus **Ophioscion** Gill.

Ophioscion Gill, Proc. Ac. Nat. Sci. Phila., 1863, 164 (type *Ophioscion typicus* Gill).

Sigmurus Gilbert, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1452 (type *Corvina vermicularis* Günther).

Bony margin of preopercle armed with strong serræ at all ages, the lowermost tooth not directed forward; gill-rakers short; teeth in the jaws in bands; caudal fin never lunate, the middle rays longer than the lower ones; soft dorsal, anal and caudal scaly.

KEY TO THE SPECIES.

a. Caudal fin lanceolate, rounded or slightly double truncate, the middle rays the longest; scales below lateral line in horizontal rows; teeth in lower jaw of uniform size, the outer ones not especially enlarged.

b. Body little compressed, the back only slightly elevated, the dorsal and ventral outlines about evenly curved; spinous dorsal very high, the second spine as long as the fourth, the third spine the longest, reaching the first ray of soft dorsal when deflexed; body without dark stripes. *simulus*, p. 637.

bb. Body notably compressed, the back elevated, the dorsal outline more strongly curved than the ventral; the spinous dorsal moderately elevated, the second spine shorter than the fourth, the third spine not reaching soft dorsal when deflexed.

c. Caudal fin lanceolate, the middle rays much produced, as long as or longer than head; rays of soft dorsal 20 to 23; developed gill-rakers below angle 9 to 13.

d. Body with faint dark streaks along the rows of scales; outer ray of ventrals with a very short filament not projecting beyond the tips of the longest fin rays; soft dorsal high, the longest rays only slightly shorter than the longest dorsal spine. *adustus*, p. 639.

dd. Body without dark streaks along the rows of scales; outer ray of ventrals produced into a filament projecting beyond the longest fin rays a distance about equal to the diameter of the eye; soft dorsal rather low, its longest rays not more than ⅔ as long as the longest dorsal spine.

e. Second dorsal spine only slightly shorter than third and not much stronger; scales 5 or 5½-54 or 55, counting transverse series above lateral line; preopercular margin with 4 to 6 teeth. *strabo,* p. 640.

ee. Second dorsal spine not more than ⅔ as long as the third, but very much stronger; scales 4-49 to 53, counting transverse series above the lateral line; preopercular margin with 10 or 11 teeth. *typicus,* p. 641.

cc. Caudal fin rounded or slightly double truncate, the middle rays much shorter than head; rays of soft dorsal 23 to 27; developed gill-rakers below angle 6 to 10.

f. Body with evident dark streaks along the rows of scales; third and fourth dorsal spines of about equal length, reaching past the tips of 3 or 4 of the succeeding spines when deflexed, outer margin of fin concave. *scierus,* p. 642.

ff. Body without dark streaks along the rows of scales; the third and fourth spines not reaching past the tips of any of the succeeding spines when deflexed, outer margin of fin not concave.

g. Dorsal rays XI-I, 24 or 25; chin without symphyseal knob; preopercle with 7 or 8 rather strong teeth, those at angle enlarged. *imiceps,* p. 643.

gg. Dorsal rays X-I, 23 to 25; chin with a small symphyseal knob; preopercular margin with 8 or 9 rather small teeth, those at the angle but little enlarged. *punctatissimus* sp. nov., p. 644.

aa. Caudal fin f-shaped, the rays of upper angle produced, longer than the median rays; rows of scales below lateral line running obliquely upward and backward, horizontal only on caudal peduncle; teeth in the lower jaw more or less unequal, the outer ones enlarged; body with prominent dark streaks. *vermicularis,* p. 645.

462. Ophioscion simulus Gilbert.

Ophioscion simulus Gilbert, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1449 (Panama); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 130, Pl. XIX, fig. 38.

This fish was not seen by us. Below is quoted the original description:

"Head 3⅗; depth 3⅗; eye 4⅖ in head. D. XI, 26; A. II, 7; P. 18 or 19; pores in lateral line 50; and smaller scales covering base of caudal fin. Body more elongate and less compressed than in other species, the head especially characterized by rounded outlines; pre-

orbitals turgid; snout blunt, scarcely at all compressed, evenly rounded in all directions; top of head everywhere transversely convex, not at all depressed over the orbits; a scarcely noticeable depression at the occiput, with the exception of which the profile rises slowly and evenly to the front of the dorsal fin; predorsal region transversely evenly convex, not compressed to a ridge except immediately in front of first dorsal spine; dorsal and ventral outlines about equally curved, the base of anal fin but little more oblique than the normal contour at that point. Mouth wide, broadly U-shaped as seen from below, overpassed by the bluntly rounded snout for a distance (taken axially) equal to ½ diameter of pupil; cleft of the mouth moderately oblique, the maxillary reaching vertical from middle of pupil; length of maxillary (measured from front of premaxillaries) 3⅓ in head; mandible with a broad band of villiform teeth of uniform size; premaxillaries with a similar broad villiform band, preceded by an outer series of small canines, close-set, smaller in size than in related species; preorbital of moderate width, swollen and turgid as in *Pachyurus*, its width 6⅓ in head; posterior nostril large, circular, without trace of raised membranous edge; anterior nostril vertically elliptical, small, and with raised margin; preopercular margin with 14 to 16 spinous teeth (in the type specimen), the upper ones minute, increasing in size toward preopercular angle, around which they evenly radiate, none conspicuously enlarged, and the lowermost not directed abruptly downward. Gill-rakers short, the longest about equaling diameter of posterior nostril, 7 movable ones on upper limb of arch, 13 below. First dorsal high, of very slender flexible spines, except the first two; second spine strong and rigid, as long as the fourth, contained 1¾ times in the head; third spine the longest, reaching when declined to base of first ray of second dorsal, its length 1⅗ in head; from the third, the spines decrease rapidly, so that the distal margin of the fin is subvertical; the tenth spine shortest, its membrane reaching base only of the eleventh, which belongs to second dorsal and is ⅔ diameter of the eye; second dorsal high, the longest ray equaling length of snout and eye; caudal sublanceolate, mutilated so that its exact shape cannot be ascertained; middle rays considerably longer than the outer, and at least ¾ length of head; second anal spine long and strong, its length 1⅔ in head, slightly greater than that of first soft ray which, however, projects beyond it; outer ventral ray produced in a very short filament, about ¼ diameter of eye; ventral spine 2⅖ in head, the longest ray, exclusive of filament, 1½ in head, reaching 5/7 distance from their base to vent; pectorals 1⅓ in head,

reaching a vertical from tips of ventrals. Lips, branchiostegals, gular membranes, and under side of snout naked, head and body otherwise scaled; scales on mandible and those in advance of nostrils cycloid or those on top of snout very weakly ctenoid, scales otherwise strongly ctenoid; second dorsal and anal with a definite low scaly sheath at base consisting of a single series of small scales, and, in addition, series of scales on the membranes extending ⅔ distance to tip. Caudal scaled to tip; lateral line with a long low curve, the height of which equals ½ diameter of orbit. Color steel gray above, without dark streaks, white below, the cheeks and lower portions of sides with much brown specking, sometimes confined to the margins of the scales; mouth white within, lining of opercles blackish; fins dusky, the distal part of ventrals black, the outer ray white; anal with the anterior rays tipped with black."

Known only from the type, a specimen 200 mm. in length, from Panama Bay.

463. Ophioscion adustus (Agassiz).

Sciæna (*Corvina*) *adusta* Agassiz, in Spix, Pisc. Brasil., 1831, 126, Pl. LXX (Montevideo).

Sciæna adusta Günther, Cat. Fish. Brit. Mus., II, 1860, 289.

Ophioscion adustus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1447.

Head 3.2 to 3.3; depth 3.1 to 3.3; D. X-I, or XI-I, 20 to 22; A. II, 7; scales 4-53 to 56, counting transverse series above lateral line.

Body compressed; the back elevated; anterior profile almost straight over head; ventral outline slightly rounded; head slightly compressed; the snout blunt, projecting but little beyond the premaxillaries, its length 3.68 to 4 in head; eye 4 to 4.25; mouth inferior, horizontal; the maxillary reaching middle of eye, 2.7 to 2.8 in head; nostrils placed close together, the anterior one with a raised membrane surrounding it; posterior margin of posterior nostril reaching adipose eyelid; snout with the usual pores and slits well developed, no knob at the symphysis of lower jaw; preopercle with about 5 teeth at lower angle and with several small serrations above these; teeth in bands in the jaws, none of the lower ones especially enlarged, the outer row in upper jaw slightly enlarged; pseudobranchiæ present; gill-rakers short, rather numerous, about 12 below angle; scales ctenoid, in horizontal series below lateral line; spinous dorsal moderately elevated, the second spine strong and about ⅔ as high as the third, the latter not longer than the fourth and not reaching the tip of any of the suc-

ceeding spines when deflexed, outer margin of fin convex; soft dorsal high, the longest rays only slightly shorter than the longest dorsal spines, a sheath formed of one row of scales at base, small scales on membrane of fin between rays; caudal fin lanceolate, the middle rays produced, as long as head; second anal spine strong, as long as the soft rays, but not projecting beyond them, 1.64 to 2 in head; outer ray of ventrals with a very short filament not reaching beyond the longest rays; pectorals not projecting beyond tips of ventrals, 1.3 to 1.4 in head.

Color brownish above, paler below; lower parts everywhere dotted with brown punctulations; faint lines along the rows of scales on back and sides; fins all dusky; lower fins dark; peritoneum pale silvery.

This species is here described from 13 small specimens, ranging from 50 to 100 mm. in length.

Known from the West Indies to the Rio de La Plata. Our specimens are from Fox Bay, Colon, and Porto Bello.

464. Ophioscion strabo Gilbert.

Ophioscion strabo Gilbert, Proc. U. S. Nat. Mus., 1896, 444 (San Juan Lagoon, south of Guaymas, Mexico); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1448; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 131.

Corvina strabo Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 3.

Head 3.4 to 3.5; depth 3.3; D. X-I, 22 or 23; A. II, 8; scales 5 or 5½-54 to 55, counting transverse series above lateral line.

Body much compressed; the back elevated; anterior profile concave over head, rising rapidly from occiput to origin of dorsal; ventral outline rounded; head rather low and little compressed; snout projecting but slightly beyond premaxillaries, its length 3.45 to 3.6 in head; eye 4.1; mouth little oblique, maxillary reaching about middle of eye, 2.94 to 3 in head; anterior nostril surrounded by a raised membrane; posterior nostril reaching adipose eyelid, placed at a distance a little greater than its longest diameter from anterior nostril; preopercle with 4 or 5 teeth, the ones at the angle enlarged; teeth in the jaws in bands, those of the lower jaw of uniform size, the outer ones in upper jaw enlarged; pseudobranchiæ present; gill-rakers short, scarcely longer than posterior nostril; scales ctenoid; spinous dorsal moderately elevated, the second spine not much stronger than the third, but nearly as long, outer margin of fin straight; soft dorsal rather low, with a low scaly sheath formed of one row of scales at

base, membrane of fin above sheath with small scales; caudal fin lanceolate, longest rays equal to or slightly longer than head; second anal spine enlarged, 1.7 to 1.85 in head; outer ray of ventrals with a short filament; pectorals short, scarcely reaching tip of ventrals.

Color uniform light brown above, paler below; no dark streaks along the rows of scales; fins all dusky; anal and ventrals almost black.

This species is here described from two type specimens, respectively 100 and 135 mm. in length, from San Juan Lagoon, Mexico.

Known from the San Juan Lagoon, Mexico. Recorded from the Rio Tuyra, Panama, by Boulenger. No other Panama records.

465. Ophioscion typicus Gill.

Ophioscion typicus Gill, Proc. Ac. Nat. Sci. Phila., 1863, 165 (west coast of Central America); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1448; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 129.

Corvina ophioscion Günther, Trans. Zoöl. Soc. London, VI, 1869, 428 (Panama).

Sciæna ophioscion Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 315.

Sciæna typica Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 404.

Head 3.3 to 3.6; depth 3.2 to 3.45; D. X-I, 22 or 23; A. II, 8; scales 4-49 to 53.

Body moderately elongate, compressed; the back elevated; anterior profile more or less concave over eyes, especially in older examples; ventral outline from snout to anal fin almost straight; head rather low; snout projecting beyond the inferior horizontal mouth, its length 3.75 to 4.8 in head; eye 3.5 to 5.2; maxillary reaching about middle of eye, 3 in head; teeth in jaws in bands, the outer row in upper jaw enlarged; cranium not spongy to touch; pseudobranchiæ well developed; gill-rakers about the length of posterior nostrils; preopercle with its bony margin serrate, the teeth at angle strongest, diverging, 10 or 11 in number; scales rather large, strongly ctenoid; spinous dorsal moderately elevated, first and second spines strong, much stronger than the third and fourth, the latter two the longest and of about equal length, not reaching second dorsal when deflexed, about 1.7 in head, outer margin of fin straight; soft dorsal rather low, with a scaly sheath formed of one row of scales at base; membrane of fin with small scales; caudal fin lanceolate, the middle rays as long as head; anal fin small, the second spine very strong, equal in length

to soft rays, but not projecting beyond them, 1.4 to 1.7 in head; ventral fins rather small, the outer ray with a filament; pectorals rather short, reaching tip of ventrals, 1.33 to 1.38 in head.

Color grayish, lower fins more or less dusky.

There are 9 specimens of this species in the Panama collection, ranging from 16 to 140 mm. in length. We have also examined 7 specimens collected at Panama in 1881 by Dr. C. H. Gilbert.

Known from Panama Bay and the Rio Dagua, Colombia. The specimens at hand are from Chame Point where they were taken by Mr. Robert Tweedlie.

466. Ophioscion scierus (Jordan & Gilbert).

Sciæna vermicularis Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 315 (not of Günther).

Sciæna sciera Jordan & Gilbert, Proc. U. S. Nat. Mus., 1884, 480 (Mazatlan; Panama).

Ophioscion scierus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1452; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 131, Pl. XIX, fig. 39.

Head 3.25 to 3.55; depth 2.8 to 3.2; D. X-I, 24 to 27; A. II, 8; scales 5-55 to 59, counting transverse series above lateral line.

Body rather robust, compressed; the back elevated; profile from anterior nostrils to first dorsal spine almost straight; ventral outline rounded; head slightly compressed; snout projecting beyond the premaxillaries, with evident pores and slits, its length 3.2 to 3.55 in head; eye 4.5 to 5.5; mouth inferior, slightly oblique; the maxillary reaching somewhat past middle of eye, 2.8 to 3 in head; posterior nostril removed from the anterior by the distance of its greatest diameter, without external raised membrane, its posterior edge reaching adipose eyelid; preopercle with about 10 teeth, those at the angle considerably enlarged; teeth in the jaws in bands, the outer ones in the lower jaw not enlarged, similar to the inner teeth, the outer row in the upper jaw moderately enlarged; pseudobranchiæ well developed; gill-rakers short and thick, about equal in length to longest diameter of posterior nostril; scales of moderate size, strongly ctenoid; spinous dorsal rather high, the second spine much stronger than the third, but not more than two-thirds as high, the third and fourth spines of about equal length, reaching past the tips of three or four of the succeeding spines when deflexed, but not reaching second dorsal, third spine 1.45 to 1.7 in head, outer margin of fin slightly concave; soft dorsal rather low, with a low scaly sheath formed of one row of scales at base, mem-

brane of fin above sheath with small scales that extend about half way up the fin; caudal slightly double truncate, the middle rays the longest; anal fin small, the second spine very strong, about as long as the soft rays, but not projecting beyond them, 1.6 to 2.2 in head; ventral fins with outer ray produced into a filament; pectorals projecting well beyond the tips of ventrals, but not reaching anal opening, 1.2 to 1.3 in head.

Color brown above, lighter below; dark streaks along the rows of scales on sides and back, these running upward and backward above the lateral line, but parallel with the long axis of the body below the lateral line; these streaks not as prominent as in *O. vermicularis;* lower parts with many brown punctulations; fins all dusky, anal and ventrals quite dark.

Here described from a series of 18 specimens, varying in length from 190 to 265 mm.

Known from the Pacific coast of tropical America, from Mazatlan to Panama. Not very abundant at Panama; our specimens are from Balboa, and the Panama City market.

467. Ophioscion imiceps (Jordan & Gilbert).

Sciæna imiceps Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 309 (Panama); Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 404.

Ophioscion imiceps Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1451; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 131.

Head 3.6 to 3.7; depth 3 to 3.2; D. XI-I, 24 or 25; A. II, 8; scales 5-53 to 56, counting transverse series above lateral line.

Body compressed; the back elevated; the anterior profile straight or slightly concave over eyes; ventral outline rounded; head compressed; snout projecting somewhat beyond premaxillaries, with evident pores and slits, its length 3.7 to 3.9 in head; eye 4.2 to 4.5; mouth inferior, horizontal; the maxillary reaching almost to posterior margin of pupil, 2.9 to 3 in head; nostrils without a prominently raised membrane, the posterior reaching adipose eyelid; preopercle with 7 or 8 rather strong spines, those at the angle the strongest, diverging; teeth in the jaws in bands, the outer ones in the upper jaw enlarged; pseudobranchiæ well developed; longest gill-rakers somewhat longer than posterior nostril, 9 or 10 on lower limb of first arch; scales ctenoid; spinous dorsal moderately elevated, the second spine stronger than third, but not more than ⅔ as high, third spine not reaching past tips of succeeding spines when deflexed, outer margin of fin straight; longest rays of second

dorsal about half as high as longest dorsal spines, fin with a low scaly sheath formed of one row of scales at base, with small scales above sheath on membrane; caudal fin double truncate, the middle rays the longest, shorter than head; anal small, second spine enlarged, 1.95 to 2 in head; outer rays of ventrals produced in a filament; pectorals rather long, reaching well past tip of ventrals, but not quite to vent, 1.1 to 1.2 in head.

Color dull brown above, pale below; no dark stripes along the rows of scales; head and lower part of sides with brown punctulations; fins all more or less brown or dusky; tip of spinous dorsal and anal quite dark.

This species is here described from three specimens from the U. S. Nat. Mus. collections, ranging in length from 10 to 185 mm.

Known only from Panama Bay. Not taken by us.

468. Ophioscion punctatissimus sp. nov. (Plate LXVIII.)

Type No. 81766, U. S. N. M.; length 140 mm.; Panama Canal, Cristobal.

Head 3.2 to 3.5; depth 2.85 to 2.95; D. X-I, 23 to 25; A. II, 8; scales 5-55 to 58, counting transverse series above lateral line.

Body rather robust, compressed; the back elevated; anterior profile straight, or slightly convex in large specimens; ventral outline slightly rounded; head rather low; snout projecting beyond premaxillaries, with pores and slits, its length 3.3 to 4.25 in head; eye 4.8 to 5.25; mouth horizontal; the maxillary reaching posterior margin of pupil, 2.9 to 3.2 in head; anterior nostril with a raised membrane; posterior nostril without an external membrane, its posterior edge reaching adipose eyelid, removed from anterior nostril by a distance equal to its longest diameter; a small knob at the symphysis of lower jaw; preopercle with 8 or 9 teeth, those at the angle not much enlarged; teeth in the jaws in bands, the outer ones in the lower jaw similar to the inner ones, the outer row in upper jaw enlarged; pseudobranchiæ well developed; gill-rakers short and thickish, scarcely longer than posterior nostril, 7 or 8 developed below angle; scales of moderate size, strongly ctenoid, in horizontal rows below lateral line; spinous dorsal moderately elevated, the second spine the strongest but not much more than half the length of the third, the third spine the longest but not reaching past the tip of any of the succeeding spines when deflexed, 1.7 to 2.1 in head; soft dorsal rather low, with a scaly sheath formed of one row of scales at base, membrane of fin with small scales extending almost to outer margin of fin; caudal fin rounded, the middle rays a little the longest, equal to or a little shorter than distance from tip of snout

to preopercular margin; second anal spine very strong, as long as soft rays but not projecting beyond them, 1.67 to 1.9 in head; outer ray of ventrals produced in a filament which reaches to vent in small specimens, shorter in the adult; pectorals rather long, reaching well past tips of ventrals, but not quite to anal opening, 1.1 to 1.3 in head.

Color brownish above, paler below; lower parts everywhere profusely dotted with brown punctulations; no dark streaks along the rows of scales; fins all dusky; peritoneum pale.

Of this species 5 specimens, ranging in length from 140 to 245 mm., were secured. One of these is from Toro Point and the others are from Colon and Cristobal.

This fish is distinguished from *O. adusta* by the short and rounded caudal fin, the middle rays being but slightly produced and much shorter than head. The outer ray of ventral fins is produced in a filament which projects well beyond the longest rays; whereas in *O. adustus* the ventral filament is very short and does not project beyond the longest rays. There are fewer gill-rakers and there is one more row of scales between the lateral line and the spinous dorsal, and no faint streaks along the rows of scales on sides and back.

469. Ophioscion vermicularis (Günther).

Corvina vermicularis Günther, Trans. Zoöl. Soc. London, VI, 1869, 427, Pl. LXVII, fig. 2 (Panama).

Sciæna vermicularis Jordan, Proc. U. S. Nat. Mus., 1885, 381.

Ophioscion vermicularis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1452.

Sigmurus vermicularis Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 132.

Head 3.2 to 3.4; depth 2.8 to 3; D. X-I, 26 to 29; A. II, 9; scales 5 or 6-66 to 69, counting transverse series above lateral line.

Body rather short and deep; the back elevated; anterior profile more or less concave over eyes; ventral outline slightly rounded; head rather low; snout slightly projecting beyond premaxillaries, without pores and slits, its length 3.4 to 4.25 in head; eye 4.65 to 5.5; mouth oblique; maxillary reaching about middle of eye, 2.8 to 3.1 in head; nostrils very close together, each with an external, raised membrane, the posterior nostril not reaching adipose eyelid; preopercle with about 15 teeth, those at the angle not much enlarged; teeth in the jaws in bands, more or less unequal, the outer ones in both jaws enlarged; pseudobranchiæ well developed; gill-rakers short and thick, not much longer than posterior nostril; scales rather small, strongly ctenoid; spinous

dorsal rather high, the second spine very strong, but not more than half as long as the third, third and fourth spines the longest, reaching past the tips of four or five of the succeeding spines when the fin is deflexed, outer margin of fin concave; soft dorsal moderate, closely scaled at base; caudal somewhat f-shaped, the upper lobe produced, shorter than head; anal fin rather small, the second spine very strong, about equal in length to soft rays, but not reaching beyond them, 1.7 to 2.5 in head; outer ray of ventrals with a filament; pectorals of moderate length, reaching slightly past tip of ventrals, 1.2 to 1.38 in head.

Color dark brown, with prominent dark streaks on back and sides which follow the rows of scales, running upward and backward, becoming parallel with the axis of the body on caudal peduncle; on most specimens these streaks are more or less wavy; lower parts with many brown punctulations; fins all dusky; ventrals and anal quite dark.

This species is here described from 8 specimens, varying in length from 220 to 260 mm.

Known only from Panama Bay. Our specimens are from the Panama City market. Apparently a rather rare species.

171. Genus **Macrodon** Schinz.

Ancylodon (Cuvier) Oken, Isis, 1817, 1182 (type *Lonchurus ancylodon* Bloch & Schneider, name preoccupied).

Macrodon Schinz, Das Thierreich, II, 1822, 482 (type *Lonchurus ancylodon;* substitute for *Ancylodon,* preoccupied).

Sagenichthys Berg, Anal. Mus. Nac. Buenos Aires, IV, 1895, 52 (type *Lonchurus ancylodon;* substituted for *Ancylodon*).

Resembling *Cynoscion*, from which it differs mainly in dentition. The teeth are larger and all the enlarged teeth are lance-shaped, being widened and more or less flattened toward the tip and then abruptly pointed, with a cutting edge at sides precisely like a lance.

KEY TO THE SPECIES.

a. Fins very densely scaled; soft dorsal, caudal and anal thickened by small scales; gill-rakers long and slender, the longest about two-thirds diameter of eye; posterior nostril oblong, much larger than the anterior; scales moderate, in about 100 transverse series above lateral line. *ancylodon,* p. 647.

aa. Fins less densely scaled; only the soft dorsal and anal thickened by scales; gill-rakers short and thick, the longest only slightly longer than diameter of pupil; posterior nostril slit-like, very small, only slightly larger than the anterior; scales very small, in about 130 transverse series above lateral line. *mordax,* p. 648.

470. Macrodon ancylodon (Bloch & Schneider).

Lonchurus ancylodon Bloch & Schneider, Syst. Ichth., 1801, 102, Pl. XXV (Surinam).

Ancylodon jaculidens Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 81 (Cayenne).

Ancylodon ancylodon Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 373 (in part, not of Bloch & Schneider).

Sagenichthys ancylodon Berg, Anal. Mus. Nac. Buenos Aires, IV, 1895, 52; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1416, Pl. CCXXI, fig. 564 (in part).

Macrodon ancylodon Gill, Proc. U. S. Nat. Mus., 1903, 1015.

Head 4.05; depth 4.5; D. X-I, 28(?); A. II, 10; scales in about 100 transverse series above the lateral line.

Body elongate, moderately compressed; the back highest at occiput; profile with a slight depression over eyes; head rather short and deep, much compressed; snout rather blunt, without pores or slits, its length 3.75 in head; eye 5.35; lower jaw projecting; mouth large, moderately oblique; the premaxillaries anteriorly on level with about lower margin of pupil; maxillary broad, reaching posterior margin of eye, 1.85 in head; snout without pores or slits; the mandibles moderate, not forming a marked angle with ventral outline; posterior nostril oblong, much larger than the anterior, the longest diameter about equal to diameter of pupil; preopercle with a striated and fringed margin; gill-rakers long and slender, much longer than the diameter of the pupil, equal to about two-thirds diameter of eye, 7 on lower limb of first arch; pseudobranchiæ very small; teeth in the jaws mostly in 2 series, one series mostly large and the other small, the large teeth all lance-shaped; upper jaw in front with two pairs of enlarged teeth, the anterior pair very large, equal in length to about one-half diameter of eye; scales moderate, cycloid; lateral line scarcely, if at all, arched, becoming horizontal at vertical from origin of soft dorsal; all the fins except spinous dorsal scaled to their tips; dorsals, caudal and anal very densely scaled, giving them a thickened appearance; spinous dorsal low, the spines weak; soft dorsal moderately elevated, the posterior rays as long as the anterior (soft dorsal injured so that the number of rays cannot be counted); caudal rhombic, the middle rays produced; anal rather large, the spines feeble, embedded in the scaly skin; ventrals very short; pectorals long, reaching much past tips of ventrals, 1.15 in head.

Color grayish above, silvery below; tip of snout dusky; lining of gill covers mostly pale silvery, with few dark points; fins mostly pale;

upper portion of axil dusky, this color extending upon the inner side of fin.

This species is here described from one specimen, 365 mm. long, (U. S. Nat. Mus., No. 53434) from Argentina. It does not occur in our collection from Panama. It is known from the South American coast, from Guiana to Argentina. We have included this description in the present work because the two known species of this genus were for a long time confused, and this seems to be the first time that a direct comparison of specimens from the Atlantic and Pacific has been made.*

We have here endeavored to set forth the apparent external differences between the two forms as revealed by a comparison of specimens at hand. In order to verify the relationship, more material from the Atlantic is much desired.

471. Macrodon mordax (Gilbert & Starks).

Ancylodon jaculidens Jordan & Gilbert, Bull. U. S. Fish Comm., II, 1882 (1883), 111 (not of Cuvier & Valenciennes).

Ancylodon ancylodon Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 373 (in part, not of Bloch & Schneider).

Sagenichthys ancylodon Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1416 (in part, not of Bloch & Schneider).

Sagenichthys mordax Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 121, Pl. XVI, fig. 32 (Panama).

Head 3.6 to 3.8; depth 4.05 to 5; D. X-I, 26 to 30; A. II, 9 or 10; scales in about 130 transverse series above lateral line.

Body elongate, little compressed; the back not much elevated; anterior profile with a depression over eyes; head compressed, deep; snout rather blunt, its length 3.75 to 4.1 in head; eye 4.5 to 5.75; lower jaw

*Since the foregoing was written, an account of "The Fishes of the Stanford Expedition to Brazil," by Edwin Chapin Starks, has been published in the Leland Stanford Junior University Publications, University Series, 1913, page 50. The following with respect to the relationship of the two species herein involved is contributed:

"Three specimens from 7 to 8 inches in length were collected at Para, which enable me to compare directly, for the first time, this species with *Sagenichthys mordax* from the Pacific.

"When *Sagenichthys mordax* was described it was compared with current descriptons of *S. ancylodon* and from these it appeared to differ in having larger scales in the lateral line, smaller scales on the rest of the body, and shorter gill-rakers. All of these characters have been inaccurately described for *S. ancylodon* and a direct comparison of the specimens from both coasts fails to show any specific differences. There are about 100 oblique series of scales above the lateral line in *S. ancylodon* (not 85) and half as many scales on the lateral line (not 75). The gill-rakers are one-third of the diameter of the eye (not two-thirds). The specimens from Para have a somewhat larger eye than those from Panama, but the difference is not too great to be accounted for by the difference in size of the specimens."

projecting; mouth large, very oblique; premaxillaries in front on level with upper margin of eye; the maxillary wide, reaching posterior margin of eye, 1.85 to 1.95 in head; snout without pores or slits; mandibles very strong, making a rather marked angle with ventral outline; posterior nostril slit-like, very small, not much larger than the anterior; preopercular margin striated and somewhat fringed; gill-rakers short and thick, not much longer than the diameter of the pupil, 7 to 8 on the lower limb of anterior arch; pseudobranchiæ very small; teeth in the jaws mostly in two series, all the large teeth lance-shaped; upper jaw at sides with an outer row of enlarged teeth, and an inner row of small teeth; in front usually with two pairs of enlarged teeth, the anterior pairs very much enlarged, exceeding in length, one-half the diameter of eye; lower jaw with large teeth in front, the outer ones the largest, at sides the inner ones are the largest and the outer ones become very small; scales very small, cycloid, those of lateral line enlarged, and again covered by small scales; lateral line only slightly arched, becoming horizontal under anterior rays of soft dorsal; all the fins, except the spinous dorsal, more or less scaly, only the soft dorsal and anal densely scaled, giving them a thickened appearance; dorsal spines weak and flexible, not very high; soft dorsal long and low; caudal with upper lobe angulate, the middle rays notably produced in young, shorter in adult, lower lobe rounded; anal rather large, the spines very feeble, embedded in the scaly skin; ventrals short, pectorals very long, reaching much beyond tips of ventrals, 1.05 to 1.28 in head.

Color grayish brown above, silvery below; tip of snout and area alongside of soft dorsal dark brown or dusky; dorsals and caudal dusky, with a dark margin; other fins pale; upper half of axil black, this color extending up the fin rays on inner side of fin; lining of gill-covers mostly dusky.

This species is here described from five specimens from Panama Bay, ranging in length from 295 to 425 mm. Our collection contains two specimens, respectively 400 and 425 mm. in length. This species was for a long time confounded with the Atlantic form *M. ancylodon*, from which it differs notably in having the fins less densely scaled, particularly the caudal which in *M. ancylodon* is thickened by small scales like the soft dorsal and anal. The scales are also notably larger on the latter; the mouth is less oblique; the posterior nostril is somewhat different in shape and very much larger, and the gill-rakers are more slender and much longer.

Known only from Panama Bay. Our specimens are from the Panama City market.

172. Genus **Isopisthus** Gill.

Isopisthus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 18 (type *Ancylodon parvipinnis* Cuvier & Valenciennes).

Upper jaw with a pair of large canines in front; lower jaw with several canines at sides; dorsal fins far apart; anal fin long, equal to or not much shorter than dorsal.

KEY TO THE SPECIES.

a. Second dorsal and anal of equal length, usually with an equal number of rays; base of second dorsal 1.3 to 1.57 in head; dorsal fins far apart, separated by a distance equal to distance from tip of upper jaw to posterior margin of eye.
parvipinnis, p. 650.

aa. Second dorsal notably longer than the anal, constantly with 2 to 4 more rays, its base 1.05 to 1.2 in head; dorsal fins separated by a distance equal to length of snout. *remifer*, p. 651.

472. Isopisthus parvipinnis (Cuvier & Valenciennes).

Ancylodon parvipinnis Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 84, Pl. CV (Cayenne).

Isopisthus affinis Steindachner, Denkschr. Ak. Wiss. Wien, XLI, 1879, 43, Pl. II, fig. 2 (Porto Alegre, Brazil).

Archoscion parvipinnis Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 353.

Isopisthus parvipinnis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1399.

Isopisthus harroweri Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 402, fig. 3 (Colon).

Head 3.35 to 3.7; depth 3.6 to 4.8; D. VI-I to VIII-I, 17 to 20; A. II, 18 to 20; scales in 100 to 116 transverse series above lateral line.

Body elongate, much compressed; the back little elevated; the anterior profile nearly straight, often with a slight depression over eyes; head much compressed, deep; snout blunt, without slits or pores, its length 3.5 to 4 in head; eye 3.6 to 4.75; lower jaw projecting; mouth large, very oblique; the premaxillaries anteriorly often above upper margin of eye; maxillary reaching about middle of eye, 1.9 to 2 in head; nostrils close together; the posterior nostril oval, notably larger than the anterior; preopercle with a striated membranous border; gill-rakers moderate, 7 or 8 on lower limb of anterior arch; pseudobranchiæ present, very small; teeth mostly in two series, a pair of large canines in front on upper jaw; lower jaw with several large canines at sides; stomach with 8 cæca; air bladder with two lateral appendages anteriorly, taper-

ing and coming to a sharp point posteriorly; scales small, cycloid, thin and deciduous; lateral line little, if at all, arched, becoming horizontal at vertical from vent; all the fins, except spinous dorsal, more or less scaled; the second dorsal and anal scaled to their tips, giving the fins a thickened appearance; dorsal fins far apart, separated by a distance equal to distance from tip of upper jaw to posterior margin of eye; spinous dorsal very small, composed of 6, more usually of 7, and occasionally of 8 weak spines; soft dorsal short, its base no longer than that of anal, 1.3 to 1.57 in head, the rays decreasing rapidly in length posteriorly, the last rays only about one-third length of the longest; caudal slightly double concave, the median rays slightly produced; anal fin long, equal in size and similar in shape to dorsal; ventrals rather short, pectorals moderate, reaching to tips of ventrals, 1.25 to 1.6 in head.

Color grayish above, silvery below; opercle with a bluish black blotch above; dorsals and caudal somewhat dusky, with a narrow black margin; lower fins pale; upper portion of axil black, this color extending up on the inner side of upper rays of pectoral; lining of gill-covers with a blotch of dusky near upper anterior angle of opercle; peritoneum pale.

Here described from 10 specimens, ranging in length from 135 to 255 mm.

Recorded from the coasts of Panama, Guiana and Brazil. Our specimens are from the Colon Reef and the Colon market.

473. Isopisthus remifer Jordan & Gilbert.

Isopisthus remifer Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 320 (Panama); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1398; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904. 117; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 124.

Archoscion remifer Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 353.

Head 3.3 to 3.5; depth 3.6 to 4.25; D. VII-I or VIII-I, 21 to 24; A. II, 17 to 19; scales in 100 to 110 transverse series above lateral line.

Body elongate, much compressed, varying greatly in depth; the back gently elevated; anterior profile with a depression over eyes; head much compressed, deep; snout blunt, without pores or slits, its length 3.65 to 4 in head; eye 3.9 to 4.25; lower jaw projecting; mouth large, oblique; the premaxillaries in front on level with or slightly below upper magin of eye; maxillary reaching about to posterior margin of pupil, 1.9 to

2.05 in head; nostrils close together; the posterior nostril not very large, oblong or slit-like in shape; preopercle with a striated membranous border; gill-rakers moderate, 8 or 9 below angle on first arch; pseudobranchiæ present, small; teeth mostly in 2 series; upper jaw with a pair of large canines in front; lower jaw with several canines at sides; stomach with 4 cæca; air bladder with 2 lateral appendages anteriorly tapering, and coming to a sharp point posteriorly; scales small, cycloid, deciduous; lateral line somewhat arched anteriorly, becoming horizontal at vertical from vent; all the fins except spinous dorsal more or less scaly; soft dorsal and anal densely scaled, giving them a rather thickened appearance; dorsal fins well separated, but not as far apart as in *I. parvipinnis*, distance between them equal to length of snout; spinous dorsal small, usually with 8, rarely with 7 weak spines; soft dorsal rather long, its base notably longer than the base of anal, 1.05 to 1.2 in head, the rays decreasing in length posteriorly, the last rays about half as long as the longest; caudal slightly double concave, the middle rays scarcely produced; anal fin moderate, similar in form to soft dorsal; ventrals rather short; pectorals reaching to or slightly past tips of ventrals, 1.25 to 1.4 in head.

Color bluish gray above, silvery below; sides with dusky punctulations; tip of lower jaw and snout above black; a bluish black blotch on opercle below upper anterior angle; all the fins except ventrals more or less dusky, with dark points; ventrals pale; some of the fins more or less yellowish in life; upper portion of axil black; lining of gill-covers largely black.

This species is here described from specimens, including the type, ranging from 200 to 265 mm. in length. Our collection contains 13 specimens.

The rather large series from both oceans of the closely related forms, *I. parvipinnis* and *I. remifer*, for the first time offer an opportunity of a direct comparison of specimens. The two can readily be separated, but the validity of the Pacific coast species, *I. remifer*, must be based on characters other than the one before given, "the much greater length of the pectoral fins," which proves to be of no value. The most notable difference lies in the size of the second dorsal, as compared with the anal. The two are of equal length and contain about an equal number of rays in *I. parvipinnis*. In *I. remifer* the second dorsal is always notably longer and larger than the anal, and constantly has from 2 to 4 more rays.

Known only from Panama Bay. Our specimens are from Panama Bay at Balboa and from the Panama City market.

173. Genus **Cynoscion** Gill.

Cestreus Gronow, Cat. Fish, 1854, 49 (type *Cestreus carolinensis* Gronow, name preoccupied).

Cynoscion Gill, Proc. Ac. Nat. Sci. Phila., 1861, 81 (type *Otolithus regalis* Cuvier & Valenciennes).

Apseudobranchus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 18 (type *Otolithus toeroe* Cuvier & Valenciennes = *Cheilodipterus acoupa* Lacépède).

Atractoscion Gill, Proc. Ac. Nat. Sci. Phila., 1862, 18 (type *Otolithus æquidens* Cuvier & Valenciennes).

Body elongate; head conical; mouth very large, oblique, the lower jaw protruding; teeth sharp, not close set, in narrow bands; tip of lower jaw without canines; upper jaw with two long canines, one often obsolete, canines tapering from base to tip; preopercle without bony serrations; lower pharyngeal bones separate, their teeth pointed; vertebræ about 14 + 10; pseudobranchiæ present; dorsal spines slender; anal spines 2, very weak; second dorsal long and low, more than twice the length of the anal.

KEY TO THE SPECIES.

a. Soft dorsal and anal completely covered with small scales, the base of the fins thickened by them.

b. Caudal lunate, the middle rays shorter than the outer; dorsal formula IX-I, 23. *othonopterus*, p. 654.

bb. Caudal rhombic, the middle rays much longer than the outer; dorsal formula VIII-I, 21. *squamipinnis*, p. 656.

aa. Soft dorsal and anal not completely covered with scales, at least the distal third without scales, often almost or wholly naked.

c. Scales cycloid, with a membranous border, those on head more or less embedded.

d. Head low and wide, somewhat depressed above; mouth wide; second dorsal with 29 or 30 rays; scales very small, in 120 to 130 transverse series above lateral line. *virescens*, p. 657.

dd. Head more or less compressed, never depressed above; mouth narrower; second dorsal with 18 to 22 rays; scales larger, in 84 to 115 transverse series above lateral line.

e. Body compressed, the back notably elevated; head much compressed, deep; snout short, lower jaw little projecting; mouth very oblique, the mandible making a marked angle with ventral outline. *prædatorius*, p. 658.

ee. Body not greatly compressed, the back little elevated; head not deep, little compressed; snout rather long, ending in the pro-

jecting lower jaw; mouth less oblique, the mandible not making a marked angle with ventral outline.

f. Basal half of dorsal and anal covered with small scales; outer margin of spinous dorsal convex. *leiarchus*, p. 659.

ff. Dorsal and anal with only a few scales on base of anterior rays; outer margin of spinous dorsal concave. *phoxocephalus*, p. 660.

cc. Scales ctenoid, without membranous border, those on head not embedded.

g. Back and sides with stripes and reticulations, or with faint dark streaks along the rows of scales; second dorsal with 23 to 28 rays.

h. Back and sides with prominent brownish stripes and reticulations; soft dorsal and anal scaleless; dorsal formula X-I, 25 to 28; scales small, in 89 to 102 transverse series above lateral line. *reticulatus*, p. 661.

hh. Faint dark streaks along the rows of scales above lateral line; soft dorsal and anal with scales, at least on lower half of fins; dorsal formula X-I, 23 to 25; scales large, in 68 to 79 transverse series above lateral line. *jamaicensis*, p. 662.

gg. Back and sides uniform bluish gray, no stripes or reticulations; second dorsal with 19 to 22 rays.

i. Snout long and pointed, its dorsal outline straight; soft dorsal with a low scaly sheath at base formed of but one row of scales; pectorals short, not nearly reaching tips of ventrals, 1.8 to 2.1 in head. *stolzmanni*, p. 663.

ii. Snout rather short and blunt, its dorsal outline distinctly convex; soft dorsal with a high scaly sheath at base, composed of 2 or 3 rows of scales; pectorals long, reaching to or nearly to tips of ventrals, 1.48 to 1.6 in head. *albus*, p. 665.

474. Cynoscion othonopterus Jordan & Gilbert.

Cynoscion squamipinnis Streets, Bull. U. S. Nat. Mus., VII, 1877, 48 (off San Ignacio River, Gulf of California; not of Günther).

Cynoscion othonopterum Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 274 (Punta San Felipe, Mexico).

Cestreus othonopterus Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 364.

Cynoscion othonopterus Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 119.

"Head 3 1/10; depth 4; eye 6⅔ in head. D. IX-I, 23; A. II, 10; scales 66, 60 pores. Body elongate, the back somewhat elevated, the profile from tip of snout to dorsal nearly straight; caudal peduncle

rather long and slender, its depth 4 in head. Head long and pointed, compressed, not regularly conical; mouth large, the lower jaw projecting; maxillary broad, reaching to or a little beyond posterior margin of orbit; premaxillaries in front on the level of lower part of pupil; length of gape 2⅓ in head. Teeth in upper jaw in a moderate band which becomes narrower laterally; upper jaw with two small canines, their length scarcely ¼ diameter of pupil; some of the other anterior teeth enlarged and larger than the lateral teeth; teeth in lower jaw in a narrow band in front, in a single series laterally, the lateral teeth much larger than the anterior. Eye moderate, broader than preorbital, narrower than maxillary, its diameter a little greater than ½ interorbital space; preopercle with its membranaceous border broad and covered with small scales. Gill-rakers long and strong, nearly as long as eye. Scales small, all with conspicuous membranaceous edges; all the fins excepting spinous dorsal completely covered with small scales, the bases of the fins thickened by them; a few scales on front of spinous dorsal; lateral line considerably curved anteriorly, becoming straight at a point in front of the vent, near the origin of soft dorsal; dorsal spines comparatively long and strong, little flexible, the third spine slightly longer than the second, 2¾ in length of head; first spine short and slender, about ⅓ length of second; dorsals not connected; second dorsal rather high, its longest rays 3½ in head; caudal fin large, lunate, the outer rays about ⅓ longer than the middle rays, which are 2¼ in head; anal large, as long as high, its distal margin perfectly straight, its longest rays about ⅓ length of head; anal spines small, enveloped in the scaly skin, the second about ⅓ height of first soft ray; anal fin terminating considerably in front of dorsal; ventrals long, not reaching quite half way to vent, their length about ½ that of head; pectorals broad, rather long, reaching a little beyond tips of ventrals, and contained 1¾ in length of head.

"Slaty-bluish above, silvery below, with bright reflections; body and fins everywhere with dark punctulations; tip of chin dark; fins yellowish, the upper all with dark edging; pectorals blackish on the posterior side, the axil and the large axillary scale dusky; lower jaw bright silvery; lining of opercle dark; peritoneum pale."

This species was not seen by us. The above description is an exact copy from Jordan & Evermann (Bull. U. S. Nat. Mus., XLVII, 1898, 1404), based on a large specimen nearly two feet in length. Apparently closely related to *C. squamipinnis,* from which it differs mainly in the shape of the caudal. Dr. Gilbert is supposed to have taken this species at Panama in 1883, but his collections, together with all notes,

were unfortunately destroyed by fire before any record was published. There are now apparently no specimens from Panama extant.

Known from the Gulf of California and from a somewhat doubtful record from Panama Bay.

475. *Cynoscion squamipinnis (Günther).

Otolithus squamipinnis Günther, Trans. Zoöl. Soc. London, VI, 1869, 429 (Panama).

Cynoscion squamipinne Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 232.

Cestreus squamipinnis Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 364.

Cynoscion squamipinnis Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 118.

Head 3.5; depth 4.2; D. VIII-I, 21; A. II, 9; scales in 85 transverse series.

Body elongate; the back scarcely elevated; anterior profile nearly straight; ventral outline anteriorly more strongly curved than the dorsal; head low, fusiform; snout long, without pores or slits, its length 3.7 in head; eye 6.2; lower jaw projecting; mouth large, oblique; maxillary reaching posterior margin of eye, 2 in head; anterior nostril very small; posterior nostril an oblong slit; preopercle with a striated membranous border; gill-rakers long, with strong serrations on inner side, 8 on lower limb of anterior arch; pseudobranchiæ small; teeth in the jaws mostly in 2 series, none of those in upper jaw much enlarged except 2 pairs of canines in front, the inner pair much the larger; the inner teeth at sides in lower jaw moderately enlarged; scales ctenoid, those on back, in front of and alongside of dorsal fins much reduced in size; lateral line scarcely arched, becoming straight somewhat in advance of vertical of vent; spinous dorsal short and rather low, the longest spine 2.8 in head; soft dorsal covered with scales, giving a thickened appearance to the fin, no sheath at base; caudal fin rhombic, the middle rays produced, small scales encroaching upon its membranes; anal fin completely scaled, the spines small and embedded; ventrals short, reaching about one-third distance from their base to vent; pectorals reaching slightly past tips of ventrals, 1.7 in head.

*Fowler (Proc. Ac. Nat. Sci. Phila., 1917 p. 132) records *C. acoupa*, a closely related South American species, from Colon. This species was not obtained by us and the record was overlooked when our specimens were studied. *C. acoupa* appears to have a shorter snout, smaller mouth and probably slightly fewer rays in the dorsal and anal fins.

Color grayish above, silvery below; sides sprinkled with dusky points; a dark axillary spot present; lining of opercle mostly black; dorsals, caudal and anal more or less dusky; pectorals and ventrals pale.

This species is here described from one specimen, 450 mm. in length, taken at Panama by Dr. C. H. Gilbert. Not taken by us.

Known from the Pacific coast of tropical America, from La Union south to Panama.

476. Cynoscion virescens (Cuvier & Valenciennes).

Otolithus virescens Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 72 (Surinam).

Otolithus microps Steindachner, Denkschr. Ak. Wiss. Wien, XLI, 1879, 38, Pl. VIII, fig. 2 (Porto Alegre, Brazil).

Cestreus virescens Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 371.

Cynoscion virescens Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1415.

Head 3.5 to 3.6; depth 4.8 to 5.2; D. X-I, 29 or 30; A. II, 8; scales in 120 to 130 transverse series above lateral line.

Body elongate, scarcely compressed; the back very slightly elevated; ventral outline more strongly rounded than the dorsal; head low and wide, depressed above; snout blunt; the lower jaw protruding; mouth large, oblique; the premaxillaries anteriorly about on level with upper margin of pupil; maxillary reaching posterior margin of eye, 2.2 in head; snout without pores or slits, 3.8 to 4.05; eye very small, 6.15 to 7.2 in head; posterior nostril oval; preopercle with crenulate membranous edge; gill-rakers short and slender, with serrations on inner edge, 6 below angle on anterior arch; pseudobranchiæ very small; teeth all rather small, the canines in front of upper jaw rather short and thick, often only one present; scales very small, cycloid; lateral line not arched, becoming straight at vertical of vent; spinous dorsal low, the spines weak and flexible, the longest 2.5 to 3 in head; soft dorsal with a scaly sheath at base, no scales on fin, the posterior rays as long as the anterior; caudal lanceolate, the median rays much produced, as long as head in young, shorter in our larger specimens; anal fin short, the rays long, the spines very small; ventrals short, reaching about one-third distance from their base to vent in specimens about 8 inches in length, apparently becoming shorter with age; pectorals long, reaching past tips of ventrals, 1.3 to 1.5 in head.

Color grayish to brownish above, silvery below; sides with dark points; a bluish green blotch on opercle; lining of gill-covers dusky; axil pale; dorsals and caudal dusky; other fins pale.

The above description is based on 4 specimens, ranging from 185 to 275 mm. in length. There is unfortunately no material available for comparison. Our specimens agree well with the scanty account given by Cuvier and Valenciennes, also with the description of *Otolithus microps* Steindachner, except that the scales are said to be weakly ctenoid, while our specimens have cycloid scales. From Jordan and Eigenmann's description they differ in having fewer gill-rakers, 5 or 6, instead of 8 below the angle, and in having a lanceolate caudal instead of an S-shaped caudal. The latter difference may be due to age, Jordan & Eigenmann's description being based on a specimen 485 mm. long.

Previously recorded only from the coast of Guiana and Brazil. Our specimens are from Fox Bay, Colon, and Colon market.

477. Cynoscion prædatorius (Jordan & Gilbert).

Cestreus prædatorius Jordan & Gilbert, in Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 363 (Panama).

Cynoscion prædatorius Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 394; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 118.

Head 3.6 to 3.9; depth 3.8 to 3.95; D. IX-I, 18 to 20; A. II, 9; scales in 84 to 93 transverse series above lateral line.

Body deep, compressed; the back elevated; anterior profile gently convex; ventral outline strongly bent anteriorly, the mandible making a marked angle with rest of ventral outline; head more compressed and deeper than in related species; snout shorter and more blunt, without slits or pores, its length 4 to 4.55 in head; eye 6.4 to 6.8; mouth large, quite oblique; premaxillaries anteriorly on level with middle of the small eye; lower jaw little projecting; maxillary reaching past posterior margin of eye, 1.95 to 2.05 in head; nostrils oval in form, the posterior much larger than the anterior, in contact with adipose eyelid; preopercular margin crenulate; gill-rakers long, the longest about ¾ length of eye, serrate on inward side, 8 or 9 on lower limb of anterior arch; pseudobranchiæ very small; teeth in upper jaw mostly in two series, the outer ones moderately enlarged, a pair of large canines in front; those of lower jaw in two series, the inner ones moderately enlarged at sides; scales thin, cycloid; lateral line rather strongly arched, becoming straight in front of vertical of vent; spinous dorsal high, the

longest spine 2 in head; soft dorsal without a distinct sheath of scales at base, usually with some scales on base of fin, fin rather high; caudal rounded or sublanceolate, the middle rays produced; anal fin large, usually scaly at base, the spines small; ventrals slightly shorter than pectorals, the latter 1.4 in head.

Color bluish gray above, silvery below; opercular lining dusky; axil brown; dorsals and caudal dusky; other fins pale.

This species is here described from 3 specimens, ranging from 320 to 400 mm. in length. Our collection contains but one specimen 400 mm. long.

Known only from the Pacific coasts of Panama and Costa Rica. Our specimen is from Panama Bay, Balboa.

478. Cynoscion leiarchus (Cuvier & Valenciennes).

Otolithus leiarchus Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 78 (Brazil; Cayenne).

Cestreus leiarchus Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 371.

Cynoscion leiarchus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1414.

Head 2.95 to 3.4; depth 3.6 to 4.15; D. IX-I or X-I, 20 to 22; A. II, 10 or 11; scales in 100 to 115 transverse series above lateral line.

Body elongate, compressed; back little elevated; anterior profile nearly straight; head elongate, compressed; snout conical, without pores or slits, its length 3.55 to 4 in head; eye 3.9 to 5.6; lower jaw protruding; mouth large, oblique; maxillary reaching from posterior margin of pupil to posterior margin of eye, 2 to 2.2 in head; posterior nostril oval, but little larger than the anterior; preopercle with crenulate membranous edge; gill-rakers rather short and slender, with serrations on inner edge, 6 to 8 on lower limb of anterior arch; pseudobranchiæ very small; teeth in the jaws mostly in 2 series, uniserial at sides in lower jaw and there somewhat enlarged; canines in upper jaw rather small, often only one present; scales cycloid, rather small, those on back in front of origin of dorsal and about base of spinous dorsal reduced in size, and often partly embedded; lateral line little arched, becoming straight at vertical from vent; stomach with 4 cæca; air bladder tapering and coming to a sharp point posteriorly, anteriorly with 3 appendages, the lateral ones are much bent and curved; spinous dorsal rather low, the spines little flexible, the longest 1.7 to 2.5 in head, outer margin of fin convex; soft dorsal without distinct sheath of scales at base, lower one-fourth to one-half covered with

small scales, the rays decreasing in length posteriorly; caudal slightly double concave, the median rays slightly produced; anal rather long, at least basal half of fin with small scales; ventrals slightly shorter than pectorals, the latter not reaching to tips of former, 1.55 to 2 in head.

Color bluish gray to brownish above, silvery below; sides with dark points and often with greenish reflections; upper half of axil dusky; dorsals and caudal more or less dusky, spinous dorsal often nearly black; lower fins usually pale.

Of this species 26 specimens, ranging from 115 to 270 mm. in length, were preserved. It is the most common of the species of this genus on the Atlantic coast of Panama.

This fish has before been known only from the coast of Guiana and Brazil. Our specimens are from Mindi Cut; Mindi Reef; Fox Bay, Colon, and Colon market.

479. Cynoscion phoxocephalus Jordan & Gilbert.

Cynoscion phoxocephalum Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881, (1882), 318 (Panama).

Cestreus phoxocephalus Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 371.

Cynoscion phoxocephalus Gilbert & Starks, Memoir. Cal. Act. Sci., IV, 1904, 120.

Head 3.1 to 4.4; depth 3.5 to 4.5; D. X-I, 20 to 22; A. II, 10; scales in 95 to 110 transverse series above lateral line.

Body elongate, fusiform, not greatly compressed; the ventral outline more strongly rounded than the dorsal; profile from tip of snout to origin of dorsal nearly straight; head conical, scarcely compressed, tapering gradually and evenly to tip of projecting lower jaw; snout without slits or pores, its length 3.4 to 4.1 in head; mouth large, oblique; the premaxillaries anteriorly about on level with middle of eye; maxillary reaching posterior margin of pupil in young, past posterior margin of eye in adult, 1.95 to 2.25 in head; eye rather small, varying greatly with age, 3.8 to 7.1 in head; posterior nostril in form of an oblong slit, not much larger than anterior nostril, not reaching adipose eyelid; preopercular margin with a crenulate membranous margin, with 2 embedded spines near the angle, these more or less exposed in the young; gill-rakers rather short and thick, with strong serrations on inward side, 6 to 8 on lower arm of anterior arch; pseudobranchiæ rather small; teeth mostly in two series in the jaws, the outer ones in upper jaw more or less canine-like, the inner ones scarcely smaller and directed inward and backward, subequal, except one pair

in front, these much enlarged; bands in lower jaw widest in front, becoming narrow at sides, the inner series larger, increasing in size at sides where the outer series disappears; teeth in large examples proportionately very much smaller than in young; in our largest specimen, 485 mm. long, the large pair of canines at tip of upper jaw missing; scales small, cycloid, those on head and anterior portion of body embedded; lateral line somewhat arched, becoming straight in front of vertical of vent; stomach with 4 cæca; air bladder anteriorly with 3 horns, all separate at the base, those at sides with a strong curve; dorsal fins separate; the spinous dorsal moderately elevated, the spines rather weak, the second and third about equal in length, 1.7 to 2.3 in head, the following spines decreasing rapidly in length, making the outer margin of fin distinctly concave; soft dorsal without distinct sheath of scales at base, small scales encroaching on base of anterior rays; caudal subtruncate or rounded in young, the middle rays the longest, lunate in adult, with the outer rays the longest; anal rather long, the spines small, scarcely distinguishable, the base of fin anteriorly with small scales; ventrals very short, about half length of head; pectorals short, not reaching tips of ventrals, 1.7 to 2 in head. .

Color grayish silvery above, with bluish and greenish reflections, silvery below; inside of mouth yellow; opercular lining black; young with a dark blotch on opercle; axil black; peritoneum pale; fins mostly dusky; anal and lower lobe of caudal yellowish.

This species is here described from specimens varying from 90 to 485 mm. in length. Our specimens are 14 in number. This species is close to *C. leiarchus* of the Atlantic, from which it, however, differs somewhat in having a less compressed body, and fewer scales on the vertical fins. There is also a difference in the shape of the spinous dorsal, the outer margin of the fin being concave, whereas in *C. leiarchus* it is convex.

Known from the Pacific coast of Panama to Peru. Our specimens are from Chame Point, Balboa, and the Panama City market.

480. Cynoscion reticulatus (Günther).

Otolithus reticulatus Günther, Proc. Zoöl. Soc. London, 1864, 149 (San José, and Chiapam, Guatemala).

Cynoscion reticulatum Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 232.

Cestreus reticulatus Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 368.

Cynoscion reticulatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1408; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV., 1904, 119.

Head 3.1 to 3.7; depth 4.2 to 4.5; D. X-I, 25 to 28; A. II, 9; scales 11 to 14 transverse series above lateral line.

Body elongate, somewhat compressed; the back scarcely elevated; ventral outline more strongly rounded than the dorsal; profile from tip of snout to origin of spinous dorsal almost straight; head conical; snout 3.2 to 4.1 in head; eye 4.2 to 5.2; the lower jaw projecting; mouth large, oblique; the premaxillaries anteriorly about on level with middle of eye; maxillary reaching posterior margin of eye, 1.8 to 2.1 in head; posterior nostril oval in form, much larger than anterior nostril; preopercle with a crenulate membranous margin; gill-rakers moderately strong, with serrations on inward edge, 6 to 8 below angle on anterior arch; pseudobranchiæ moderately developed; teeth in the jaws rather large, mostly in two series, directed inward and backward, mostly canine-like; upper jaw with a pair of strong canines in front; scales rather small, ctenoid; lateral line becoming straight well in advance of vent; dorsal fins notched to the base, separate; spinous dorsal rather high, the spines weak and flexible, the longest 1.6 to 2.2 in head; soft dorsal long, with a scaly sheath at base, no scales on fin, the rays increasing in length posteriorly; caudal slightly double truncate, the middle rays slightly the longest, at least in young; anal rays rather long, the spines small and embedded in heavy skin; ventrals short, scarcely more than half the length of head; pectorals rather long, reaching tips of ventrals, 1.35 to 1.6 in head.

Color reddish brown above, silvery below; back and sides with dark brown streaks and reticulations; lower part of sides from tip of snout to base of caudal with dark points; axil dusky above; dorsals and caudal somewhat dusky; caudal yellowish in life; other fins pale.

This species is here described from specimens ranging from 250 to 360 mm. in length. Our collection contains 9 specimens. This fish is said to reach a large size, but no large individuals were seen by us.

Known from the Pacific coast of tropical America, from Mazatlan to Panama. The specimens are all from the Panama City market.

181. Cynoscion jamaicensis (Vaillant & Bocourt).

Otolithus jamaicensis Vaillant & Bocourt, Miss. Sci. Mex., etc., Pt. IV, 1883, 156, Pl. VI, figs. 1, 1a, 1b, 1c, 1d (Jamaica).

Cynoscion jamaicensis Jordan & Rutter, Proc. Ac. Nat. Sci. Phila., 1897, 214; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1406; Fowler, Proc. Ac. Nat. Sci. Phila., 1906, 204 (Colon).

Head 3.2 to 3.4; depth 3.55 to 3.8; D. X-I, 23 to 25; A. II, 9; scales in 68 to 79 transverse series above lateral line.

Body compressed, rather deep; the back moderately elevated; anterior profile slightly convex; ventral and dorsal outlines about evenly curved; head compressed, rather deep; the snout rather short and blunt, its length 3.5 to 3.9 in head; eye large, 3.8 to 4.0; the lower jaw little projecting; mouth large, oblique; the maxillary reaching to or slightly past posterior margin of pupil, 2 to 2.15 in head; snout without pores or slits; posterior nostril an oblong slit; preopercle with a striated membranous border; gill-rakers rather short, with strong serrations on inner edge, 7 or 8 below angle on anterior arch; pseudobranchiæ well developed; teeth rather weak, mostly in two series, one of the pair of large canines in front of upper jaw often missing; scales rather large, ctenoid; lateral line arched, bent downward rather abruptly and becoming straight under anterior rays of second dorsal; spinous dorsal rather low, the spines flexible, the longest 1.95 to 2 in head; soft dorsal without a distinct sheath of scales at base, lower two-thirds of fin scaly; caudal slightly double concave, the median rays the longest, basal portion of fin covered with small scales; anal small, scaly, the spines very weak, embedded in skin so that they are not readily distinguishable; ventrals and pectorals of about equal length, the latter not reaching tips of the former, 1.55 to 1.65 in head.

Color brownish above, silvery below; sides with dusky punctulations; rows of scales above lateral line with faint dark streaks, which run obliquely upward and backward, becoming horizontal only on caudal peduncle; upper half of axil black; lining of gill-covers black; a bluish black blotch at upper anterior angle of opercle; dorsals, caudal and pectorals dusky; dorsals and caudal with a black margin; upper ray of pectoral black; anal and ventrals pale.

Of this species 3 specimens, 175 to 240 mm. long, were obtained. It is here described from these and one additional specimen, 270 mm. long, from Porto Rico.

This fish is known only from the West Indies and Colon. Our specimens are from the Colon market.

482. Cynoscion stolzmanni (Steindachner).

Otolithus stolzmanni Steindachner, Denkschr. Ak. Wiss. Wien, XLI. 1879, 35, Pl. II, fig. 1 (Tumbez, Peru).

Cynoscion stolzmanni Jordan & Gilbert, Bull. U. S. Fish Comm., I. 1881 (1882), 320; Jordan & Evermann, Bull. U. S. Nat. Mus.,

XLVII, 1898, 1412; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 119.

Cestreus stolzmanni Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 370.

Head 3.6 to 4; depth 3.9 to 4.9; D. IX-I or X-I, 19 to 21; A. II, 9; scales in 72 to 85 transverse series above lateral line.

Body elongate, somewhat compressed; anterior profile straight; ventral outline anteriorly much more rounded than the dorsal; head somewhat compressed; snout long, conical, without slits or pores, its length 3.3 to 4.4 in head; eye 5.2 to 7.65; lower jaw projecting; mouth large, oblique; the premaxillaries anteriorly on level with upper margin of eye; maxillary reaching to or past posterior margin of eye, 2 to 2.3 in head; no slits or pores on snout; posterior nostril an oblong slit, in contact with adipose eyelid; preopercle with a crenulate membranous margin; gill-rakers rather long, with strong serrations on inner edge, 6 to 8 on lower limb of anterior arch; pseudobranchiæ present, rather small; teeth mostly in 2 series; canines in upper jaw present at all ages; scales moderate, weakly ctenoid, apparently becoming smoother with age; lateral line somewhat arched, becoming straight at about vertical from origin of second dorsal; stomach with 4 cæca; air bladder tapering posteriorly, coming to a sharp point near vent, anteriorly with 3 distinct appendages, one arising from the anterior end of bladder, the others from lateral sides of anterior fourth of bladder; spinous dorsal moderately elevated, the spines flexible, the longest 1.65 to 2.16 in head; soft dorsal with a low scaly sheath at base, composed of one row of scales, no scales on fin, the rays decreasing in length posteriorly; caudal fin slightly double truncate in young, the middle rays the longest, the upper angle produced in adult; anal fin large, the spines small, embedded; ventral fins rather long, longer than pectorals, the latter 1.8 to 2.1 in head.

Color steel-blue above, silvery below; sides with dark points; opercular lining and upper half of axil black; ventrals pale; all other fins with more or less dusky; soft dorsal with black margin.

Of this species 10 specimens were preserved. They range from 285 to 900 mm. in length, and form the basis of the above description. Much larger examples were seen. It grows to a large size and is a food fish of importance.

Known from the Pacific coast of tropical America, from Panama to Peru. Our specimens are from Chame Point; Panama Bay, Balboa, and the Panama City market.

483. Cynoscion albus (Günther).

Otolithus albus Günther, Proc. Zoöl. Soc. London, 1864, 149 (Chiapam, Guatemala).

Otolithus cayennensis Vaillant & Bocourt, Miss. Sci. Méx., etc., Pt. IV, 1883, 156 (La Union).

Cynoscion album Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 319.

Cestreus albus Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 370.

Cynoscion albus Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 119.

Head 3.45 to 3.7; depth 4.1 to 4.44; D. IX-I or X-I, 19 to 22; A. II, 8 or 9; scales in 82 to 90 transverse series above lateral line.

Body rather robust, compressed; the back somewhat elevated; profile convex over snout, straight over head; dorsal and ventral outlines anteriorly about evenly rounded; head large, not much compressed; the snout rather short and blunt, without slits or pores, its length 4.0 to 5.3 in head; eye 6.0 to 8.5; the lower jaw protruding; mouth large, oblique; the premaxillaries anteriorly on level with lower margin of pupil; the maxillary reaching well past posterior margin of eye, 2.1 to 2.2 in head; eye small, varying greatly with age; anterior nostril small and rounded; posterior nostril oval, much wider than in *C. stolzmanni;* preopercle with crenulate membranous margin; gill-rakers long, the inner edge with strong serrations, 8 or 9 on lower limb of anterior arch; pseudobranchiæ small; teeth as in other species, mostly in two series; canines present at all ages; teeth in large examples proportionately much smaller than in young; scales moderate, ctenoid; lateral line arched, becoming straight well in advance of vent; spinous dorsal high, the spines rather strong, the longest 1.85 to 2.6 in head; soft dorsal with a high scaly sheath at base, composed of 2 or 3 rows of scales, the young with small scales on anterior rays of fin, these missing in our large examples, the rays decreasing in length posteriorly; caudal sublanceolate, the middle rays much longer than others; anal rays long, the spines small and embedded; ventrals moderate, shorter than pectorals, reaching half way to vent in young, shorter in adult; pectorals long, reaching to or nearly to tips of ventrals, 1.48 to 1.6 in head.

Color bluish gray above, silvery below; sides with dark points; opercular lining black; axil not black; dorsals and caudal dusky; other fins pale.

Our collection contains but two large specimens of this species. The above description is based on these and three additional specimens from

the U. S. National Museum collection. Specimens examined vary in length from 400 to 650 mm. This fish grows to a large size.

This species is distinguished from *C. stolzmanni* by the wider and more rounded snout, higher sheath of scales at base of soft dorsal, the sublanceolate caudal, the absence of a black axil, and by the much longer pectorals.

Known from the Pacific coast of tropical America, from Panama south to Ecuador. Our specimens were taken at Chame Point.

174. Genus **Menticirrhus** Gill.

Menticirrhus Gill, Proc. Ac. Nat. Sci. Phila., 1861, 86 (type *Perca alburnus* Linnæus = *Cyprinus americanus* Linnæus).

Umbrula Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 424 (type *Umbrina littoralis* Holbrook).

Body elongate, little compressed; head long, subconical; the snout blunt, always projecting considerably beyond mouth; the mouth horizontal, inferior; both jaws with bands of villiform teeth, the outer row in upper jaw more or less enlarged; upper lip with slits and pores; the chin with a single stoutish barbel; gill-rakers short, tubercular or obsolete; dorsal spines high, flexible, 10 or 11 in number; anal fin with a single weak spine; no air bladder; lower pharyngeals separate, the teeth varying from very sharp to obtuse.

KEY TO THE SPECIES.

a. Gill-rakers present; snout projecting very little beyond premaxillary, not more than one-third length of eye; mouth small, the maxillary not reaching beyond anterior margin of pupil; teeth in outer series of upper jaw scarcely enlarged; scales on breast small. *elongatus*, p. 667.

aa. Gill-rakers obsolete or tubercular, more developed in the young; snout projecting beyond premaxillary from one-half to two-thirds the length of the eye; mouth large, the maxillary reaching past the anterior margin of the pupil; teeth in outer series of upper jaw more or less enlarged; scales on breast large.

b. Upper lobe of caudal fin projecting beyond the lower lobe; second and third dorsal spines produced, of about equal length, longer than the fourth spine; posterior nostril reaching adipose eyelid; eye large, 4.2 to 5 in head in specimens ranging from 200 to 300 mm. in length; outer series of teeth in upper jaw not greatly enlarged. *nasus*, p. 668.

bb. Upper lobe of caudal fin shorter than lower lobe; third dorsal spine greatly produced, longer than the second, the latter shorter than the fourth; posterior nostril not reaching adipose eyelid; eye comparatively smaller, 5.5 to 6.6 in head in specimens ranging in length from 200 to 300 mm.; outer series of teeth in upper jaw notably enlarged.

c. Anal fin long, with 9 soft rays; soft dorsal short, with 19 to 22 rays. *panamensis*, p. 669.

cc. Anal fin short, with 7 soft rays; soft dorsal long, with 22 or 23 rays. *martinicensis*, p. 670.

484. Menticirrhus elongatus (Günther).

Umbrina elongata Günther, Proc. Zoöl. Soc. London, 1864, 148 (Chiapam, Guatemala).

Menticirrus elongatus Jordan & Gilbert, Bull. U. S. Fish Comm., II, 1882 (1883), 107; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 134.

Menticirrhus elongatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1476.

Head 3.3 to 3.4; depth 4.5; D. X-I, 22 to 24; A. I, 7; scales above lateral line 80 to 85.

Body much elongated, little compressed; back gently elevated; dorsal profile evenly convex; head long; snout blunt, projecting beyond the premaxillaries, its length 2.9 to 3 in head; eye 5.7 to 5.8; anterior nostril slightly oval, with a dermal flap on its posterior edge; posterior nostril elliptical, its posterior end pointed, placed well in front of the eye, its posterior edge removed from the adipose eyelid by a distance equal to the length of its longest diameter; mouth horizontal, inferior, the maxillary reaching to or slightly past anterior margin of pupil; teeth in bands on the jaws, the outer series in the upper jaw but little enlarged; preopercle with a membranous edge, with a few short and well separated teeth; gill-rakers present, short and blunt, from 3 to 5 below angle on anterior arch; pseudobranchiæ well developed; origin of spinous dorsal just back of vertical of base of pectoral fins; the spines weak and flexible, rather low, the third the longest, reaching to origin of soft dorsal, 1.4 in head; soft dorsal rather low, the base very long, much longer than head, about 3.75 in length of body; lower lobe of caudal shorter than upper; anal fin small, the rays rather high, the base very short; pectoral rather short and broad, reaching but slightly past tips of ventrals, 1.4 in head.

Color bluish on back and sides, silvery below.

This species was not taken by us at Panama. Gilbert & Starks (Memoir. Cal. Ac. Sci., IV, 1904, 134) report having seen it frequently. It is here described from two specimens, 310 and 330 mm. in length, one from Panama, and the other from Mazatlan.

This species is known to range from Mazatlan to Panama.

485. Menticirrhus nasus (Günther).

Umbrina nasus Günther, Trans. Zoöl. Soc. London, VI, 1869, 426 (Panama).

Menticirrus nasus Jordan & Gilbert, Bull. U. S. Fish Comm., II, 1882 (1883), 107 and 111; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 133.

Menticirrhus simus Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 427.

Menticirrhus nasus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1473.

Head 3.25 to 3.65; depth 3.55 to 4.4; D. X-I, 21 to 23; A. I, 8, rarely I, 9; scales above the lateral line 54 to 64.

Body elongate, not much compressed; the back regularly arched; head long, subconical; snout long and blunt, projecting beyond the premaxillaries, its length 3.1 to 3.4 in head; eye 4.15 to 5; anterior nostril round or slightly oval, with a dermal flap on its posterior edge; posterior nostril broadly to narrowly elliptical, its posterior end pointed and reaching the beginning of adipose eyelid; mouth horizontal, inferior; upper lip with five incisions, a large pore at the forward end of each; 3 smaller pores in front of these under tip of snout; maxillary reaching almost to posterior margin of pupil; lower jaw with a single large, thickish barbel at its tip, with two large pores in the lower lip on either side of it; teeth small, in bands in the jaws, the outer rows usually more or less enlarged; preopercle with a membranous border, with few widely separated teeth; gill-rakers obsolete; pseudobranchiæ well developed; scales large and strongly ctenoid; first dorsal beginning at vertical from back of base of pectorals; spines rather long and flexible; the second and third much produced, reaching to or past origin of second dorsal to third or fourth ray, 1 to 1.45 in head; base of soft dorsal very long, about 2.75 in length of body, the rays rather low; caudal fin S-shaped, the upper angulated lobe longer than the lower rounded lobe; anal fin small, the spine very weak, the rays rather high; pectoral fins wide, not quite reaching to vertical of anal opening, 1.1 to 1.2 in head; ventral fins short, reaching only about half the distance from their base to origin of anal fin.

Color dark grayish above, more or less silvery on sides, paler below; sides and often the belly with dusky punctulations; some specimens with about 3 dark bars on sides, these running obliquely upward and backward, the last one becoming quite horizontal on caudal peduncle; these bars entirely missing on several specimens; fins all dusky.

Here described from a series of 16 specimens, ranging in length from 220 to 280 mm. A study of our series substantiates the finding of Gilbert & Starks (Memoir. Cal. Ac. Sci., IV, 1904, 133) that *M. nasus* Günther and *M. simus* Jordan and Eigenmann are identical.

This species is found on the Pacific coast from Mazatlan to Panama. Our specimens are from Balboa and the Panama City market.

486. Menticirrhus panamensis (Steindachner).

Umbrina panamensis Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXII), Ichth. Beitr., IV, 1875, 9 (Panama).

Menticirrus panamensis Jordan & Gilbert, Bull. U. S. Fish Comm., II, 1882 (1883), 107 and 111; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 134.

Menticirrhus panamensis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1473.

Head 3.2 to 3.4; depth 3.85 to 4.6; D. X-I, 19 to 22; A. I, 9; scales above lateral line 57 to 66.

Body elongate, not much compressed; back but little arched; profile from tip of snout to origin of spinous dorsal almost straight; head long, conical; snout long and blunt, projecting beyond the premaxillaries, its length 3.3 to 3.8 in head; eye 3.3 (young) to 6.6 (adult); anterior nostril round or slightly oval; the posterior nostril oval, its posterior edge not reaching eye by the length of its longest diameter; eye small, comparatively much smaller than in *M. nasus,* varying greatly with age; mouth horizontal, inferior; maxillary extending to posterior margin of pupil; upper lip and lower jaw as in *M. nasus;* teeth in bands in the jaws, the outer series enlarged, especially those of the upper jaw; preopercle with a membranous edge with few and widely separated teeth; gill-rakers somewhat developed in young, tubercular in adult; pseudobranchiæ well developed; scales strongly ctenoid; origin of spinous dorsal a short distance back of vertical from base of pectorals, the spines long and flexible, the third spine the longest, reaching past origin of soft dorsal to about the third or fourth ray, 1.1 to 1.4 in head; soft dorsal low, its base long, equal to or a little longer than head; lower lobe of caudal fin notably longer than upper lobe; pec-

toral fin large, reaching considerably past tips of ventrals, 1.2 to 1.45 in head; ventral fins short, not nearly reaching vent.

Color brownish above, lighter below; sides and belly with brown punctulations; our small specimens with traces of darker oblique bars and blotches on sides; fins mostly dusky, sometimes almost black.

This species is represented by 8 specimens in the present collection, ranging in length from 70 to 230 mm.

M. panamensis differs from *M. nasus* in having a smaller eye, larger teeth in the outer row of the upper jaw and smaller nostrils placed further from the eye. The anal fin almost constantly has one more ray, and the upper lobe of the caudal is shorter than the lower lobe.

This species is found on the Pacific coast from Mazatlan to Peru. Our specimens are from Chame Point, Balboa, and Panama City market.

487. Menticirrhus martinicensis (Cuvier & Valenciennes).

Umbrina martinicensis Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 186 (Martinique).

Umbrina gracilis Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 189 (Brazil).

Umbrina arenata Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 190 (Brazil).

Umbrina januaria Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXIV). Ichth. Beitr., V, 1876, 122 (Rio de Janeiro).

Menticirrhus martinicensis Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 429; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1473.

Head 3.35 to 3.5; depth 3.8 to 4.15; D. X-I, 22 or 23; A. I, 7; scales above lateral line 72 to 78.

Body elongate, not much compressed; the back gently elevated and evenly arched; head rather long, subconical; the snout long and blunt, projecting beyond the premaxillaries, its length 3.2 to 3.7 in head; eye 4 to 6.4; anterior nostril rounded, the posterior one elliptical, its posterior end pointed, not quite reaching adipose eyelid; eye small, varying greatly with age; mouth horizontal, inferior; maxillary reaching from below middle of eye to posterior margin of pupil; teeth in bands in the jaws, the outer row in upper jaw much enlarged; preopercle with a membranous border, with well separated teeth; gill-rakers tubercular in adult, somewhat more developed in young; pseudobranchiæ well developed; origin of spinous dorsal at vertical of base of pectorals, the spines of moderate length, flexible, the third the longest, sometimes

scarcely reaching origin of soft dorsal, often reaching past origin of soft dorsal to second or third ray, 1.35 to 1.65 in head; soft dorsal low, its base long, about 2.75 in body; lower lobe of caudal fin projecting; anal fin short, the rays rather high; pectoral fins broad but not very long, 1.2 to 1.45 in head; ventral fins very short, extending only a little more than half the distance from their base to origin of anal, proportionately much longer in young.

Color grayish silvery; often with oblique bars and blotches on back and sides; fins all with more or less dusky, sometimes quite dark.

Of this species 13 specimens were obtained. They vary in length from 65 to 290 mm.

M. martinicensis is certainly very close to *M. americanus*. After comparing the present series with a large series of *M. americanus* from various points along the southern coast of the United States, we note no difference other than that *M. martinicensis* constantly has one or two fewer rays in the second dorsal fin. It may then be regarded as a southern form of *M. americanus*.

Ranges from the West Indies to Patagonia. Our specimens are from Fox Bay, Colon, and Colon market.

175. Genus **Paralonchurus** Bocourt.

Paralonchurus Bocourt, Nouv. Arch. Mus. Hist. Nat. Paris, V, 1869, 21 (type *Paralonchurus petersi* Bocourt).

Polycirrhus Bocourt, Nouv. Arch. Mus. Hist. Nat. Paris, V, 1869, 22 (type *Polycirrhus dumerili* Bocourt, name preoccupied).

Polyclemus Berg, Anal. Mus. Nac. Buenos Aires, IV, 1895, 54 (type *Polycirrhus dumerili* Bocourt; substitute for *Polycirrhus*, preoccupied).

Body more or less elongate; preopercle with a serrated membranous border; a row of slender barbels on inner edge of the dentary bones, and a tuft at the chin; pseudobranchiæ obsolete or nearly so; gill-rakers little developed; teeth in jaws in bands, the outer ones sometimes enlarged; soft dorsal long and low, caudal fin rather long, usually more or less pointed.

KEY TO THE SPECIES.

a. Body with more or less distinct cross-bars; eye moderate or rather large, 4.5 to 6.6 in head; pectoral fin rather small, equal to or shorter than head, not reaching vent; outer teeth in upper jaw not notably enlarged; scales on sides and back strongly ctenoid.

b. Anal fin small, with 7 soft rays; soft dorsal moderate, 23 to 27 rays.

c. Body with very prominent broad black cross-bars; soft dorsal short, with 23 or 24 rays; eye large, 4.75 to 5 in head. *dumerilii*, p. 672.

cc. Body dusky, with rather indistinct cross-bars; soft dorsal longer, with 26 or 27 rays; eye small, 6 to 6.6 in head. *goodei*, p. 673.

bb. Anal fin larger, with 8 or 9 soft rays; soft dorsal long, with 29 or 30 rays.

d. Body with 4 or 5 very faint, broad, dusky cross-bands; eye large, 4.5 to 4.7 in head; caudal fin more or less truncate, not pointed; outer ray of ventral fins produced in a filament. *rathbuni*, p. 674.

dd. Body with 8 or 9 rather narrow, distinct cross-bands; eye small, 5.3 to 5.5 in head; caudal fin more or less pointed; outer ray of ventrals not produced in a filament. *brasiliensis*, p. 675.

aa. Body without dark cross-bars; eye very small, about 9 in head; pectoral fins very large, somewhat longer than head, reaching vent; outer teeth in upper jaw notably enlarged; scales on sides and back cycloid or nearly so. *petersi*, p. 676.

488. Paralonchurus dumerilii (Bocourt).

Polycirrhus dumerilii Bocourt, Bull. Nouv. Arch. Mus. Hist. Nat. Paris, V, 1869, 22 (La Union, San Salvador).

Genyanemus fasciatus Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXI) Ichth. Beitr., II, 1875, 31 (Panama).

Paralonchurus dumerili Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1478.

Polyclemus dumerili Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 134.

Head 3.3 to 3.75; depth 3.1 to 3.5; D. IX-I, 23 or 24; A. II, 7; scales above lateral line 58 to 68.

Body somewhat elongate, compressed, the depth increasing greatly with age; the back elevated; anterior profile rather steep, concave over orbits; head low and wide, as wide as deep at eyes; the snout wide and thick, projecting beyond the premaxillaries, its length 3.2 to 3.6 in head; eye 4.7 to 5.3; mouth inferior, almost horizontal; the maxillary reaching to or slightly past the middle of the eye, 2.75 to 3 in head; teeth in the jaws minute, none of them notably enlarged; preopercle with a ciliated membranous edge; gill-rakers tubercular, 5 to 7 below angle on anterior arch more or less developed; pseudobranchiæ absent; scales all

strongly ctenoid, except those below eyes, on snout and on the anterior portion of the breast; spinous dorsal rather high, origin over base of pectorals, the spines flexible; soft dorsal long, rather low, with a scaly sheath at base, small scales on membrane between rays; caudal fin somewhat truncate, the rays just below the middle of the fin the longest; anal fin short, the rays long, the second spine strong, 3 to 3.8 in head; ventral fins inserted at vertical from back of base of pectorals, the outer ray produced in a short filament; pectoral fins very short and wide, not reaching tip of ventrals, 1.3 to 1.5 in head.

Color above bluish, with silvery reflections; sides silvery and golden, sprinkled with rusty punctulations; head steel-blue, sides with six jet black vertical bars; dorsal and anal bluish green; dorsal with black margin; other fins all yellowish at base, with bluish punctulations at tips. (Color description from field notes.)

Of this abundant species 15 specimens, ranging from 240 to 335 mm. in length, were taken.

Known from Panama Bay to Ecuador. Our specimens are from Balboa, and the Panama City market.

489. Paralonchurus goodei Gilbert.

Paralonchurus goodei Gilbert, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1480 (Panama).

Polyclemus goodei Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 135, Pl. XX, figs. 40, 40a; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 125.

Head 3.9 to 4.15; depth 3.7 to 4.3; D. X-I, 26 or 27; A. II, 7; scales above lateral line 69 to 80.

Body elongate, compressed posteriorly; the back moderately elevated; anterior profile more or less depressed over orbits; head short and broad, as broad as deep; snout blunt, projecting beyond the premaxillaries, its length 3.4 to 3.7 in head; eye 6 to 6.6; the mouth inferior, almost horizontal; the maxillary reaching to or almost to posterior margin of orbit, 2.7 to 2.9 in head; none of the teeth in the jaws notably enlarged; preopercle with a crenated membranous edge; pseudobranchiæ obsolete; gill-rakers tubercular, about 5 or 6 below angle on anterior arch more or less developed; scales rather small, strongly ctenoid, except on snout, below eye and on breast; origin of first dorsal over base of pectorals, the spines rather short and strong, the third and fourth the longest; second dorsal fin long, somewhat thickened by scales covering almost the whole fin; caudal fin with small scales, lanceolate, the longest rays below middle of fin, the lower angle much

sharper than the upper; anal fin very small, the spines weak, the second 3.2 to 3.7 in head; ventral fins rather large, the outer rays produced, inserted just posterior to base of pectorals; pectorals rather short, reaching only slightly past tip of ventrals, equal to length of head.

Color dark brown above, with bluish reflections; sides silvery, with brown punctulations; pale underneath; back and sides with 4 broad inconspicuous dark bars; lower fins yellowish at base, bluish at tips; other fins blackish. (Color description from field notes.)

Of this species only 4 specimens were obtained, ranging from 250 to 270 mm. in length.

This fish is known only from Panama Bay. Our specimens are from the Panama City market.

490. Paralonchurus rathbuni (Jordan & Bollman).

Polycirrhus rathbuni Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 162 (Panama).

Paralonchurus rathbuni Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1479.

Polyclemus rathbuni Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 135.

Head 3.45 to 3.6; depth 4.5 to 4.7; D. X-I, 29 or 30; A. II, 9; scales 54 to 56.

Body somewhat elongate, compressed; the back elevated; anterior profile convex over snout, straight or slightly depressed over orbits; head low; the snout blunt, projecting beyond premaxillaries, its length 3.7 to 4 in head; eye 4.5 to 4.7; mouth inferior, horizontal; the maxillary reaching to or a little past middle of pupil, 2.6 in head; teeth minute, the outer ones in upper jaw somewhat enlarged; preopercle with a crenulate membranous edge; gill-rakers short and thick, 8 or 9 below angle on anterior arch; scales on snout and anterior part of breast cycloid, on back and sides strongly ctenoid; origin of spinous dorsal over base of pectorals, rather high, the spines flexible, the third and fourth the longest; the soft dorsal very long, not very high and not covered with scales; the middle rays of the caudal the longest; anal fins rather large, the spines short, the second 3.1 to 3.3 in head; ventral fins short, not nearly reaching vent, the outer ray produced in a filament; pectorals not reaching to tip of ventrals, 1.6 in head.

Color bluish silvery on back and sides, yellowish below; scales on sides from base of pectorals to base of caudal fin with large dusky punctulations; a large black scapular blotch; sides with 4 or 5 faint broad dusky bands; membrane of dorsal fins thickly sprinkled with dusky

punctulations; the middle of soft dorsal with a pale streak; other fins all more or less dusky.

Only the types, 2 specimens, 170 and 180 mm. long, are known. These were taken by the Albatross at Panama.

491. Paralonchurus brasiliensis (Steindachner).

Genyanemus brasiliensis Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXI) Ichth. Beitr., II, 1875, 34 (Para, Santos).

Micropogon ornatus Günther, Repts. Voy. H. M. S. Challenger, Zoöl., I, 1880, 13, Pl. VII, fig. A (mouth of Rio de la Plata).

Polycirrhus brasiliensis Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 415.

Head 4.1 to 4.2; depth 3.7; D. X-I, 30; A. II, 9; scales above lateral line 68 to 72.

Body elongate, compressed; the back elevated; profile very convex over anterior portion of snout, almost straight from posterior nostril to origin of dorsal; head rather small, deeper than wide at eyes; snout short, projecting slightly beyond the premaxillaries, its length 3.65 to 4 in head; eye 5.3 to 5.5; mouth inferior, not quite horizontal; the maxillary reaching to posterior margin of pupil, 2.7 to 2.85 in head; teeth in the jaws minute, none of them notably enlarged; preopercle with a ciliated membranous edge; gill-rakers short and weak, 5 below angle on anterior arch; pseudobranchiæ absent; scales all ctenoid, except those on snout below eye and on the breast; origin of dorsal slightly back of base of pectorals, the spines rather high, weak and flexible, the third and fourth the longest; soft dorsal long, the rays low, the posterior ones the longest; caudal fin pointed, the longest rays below the middle of the fin, a little longer than the head; second anal spine rather strong, about half as long as the long soft rays, 2.8 in head; ventral fins inserted back of base of pectorals, rather small, none of the rays filamentous; pectoral fins reaching tip of ventrals, 1.15 to 1.2 in head; vertical fins all more or less scaly.

Color brownish above, silvery below; sides of body and head sprinkled with brownish punctulations; back and sides with 8 or 9 rather indistinct dark vertical bars; fins all with dusky punctulations, the lower ones paler.

This species is represented in the present collection by only 2 specimens, respectively 175 and 190 mm. in length. Both were taken on the same date (May 21, 1911). Although a special effort was made to obtain more specimens of this species during the 3 months of our stay in Panama in 1912, it was not again seen.

This fish has previously been recorded only from the coasts of Brazil, Uruguay and Argentina. Our specimens are from the Colon market.

492. Paralonchurus petersi Bocourt.

Paralonchurus petersi Bocourt, Bull. Nouv. Arch. Mus. Hist. Nat. Paris, V, 1869, 22 (La Union, San Salvador); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1481; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 136, Pl. XX, fig. 41.

Head 3.4; depth 4.2; D. X-I, 33 to 36; A. II, 8; scales, counting transverse series above lateral line, 54 to 56.

Body elongate; the back little elevated; dorsal profile gently convex, except over orbits, where it is straight; head large, rather low and wide; snout blunt, projecting beyond premaxillaries, its length 3.6 in head; eye 9.3; mouth horizontal, inferior; maxillary reaching to posterior margin of eye, 2.8 in head; eye very small; teeth in bands in the jaws, the outer row of upper jaw conspicuously enlarged; preopercle with a serrated membranous edge; pseudobranchiæ somewhat developed; gill-rakers present, very short, 5 below angle on anterior arch; scales rather large, cycloid above lateral line, more or less ctenoid below lateral line; origin of spinous dorsal over base of pectorals, the spines low and rather weak; soft dorsal low, highest posteriorly; caudal fin lanceolate, the rays just below middle of fin the longest; anal fin small, spines weak, the second 3.5 to 5 in head; ventrals small and short, inserted below base of pectorals; pectorals very large, reaching to vertical from anal opening, as long as head.

Color grayish brown above, with blue and bronze reflections; under parts pale; all the fins except spinous dorsal are deep blue.

This apparently is a very rare species. Only two specimens, respectively 230 and 280 mm in length, were obtained.

Known only from the west coast of Central America and Panama. Our specimens are from the Panama City market.

176. Genus **Eques** Bloch.

Eques Bloch, Naturg. Ausl. Fische, VII, 1793, 90 (type *Eques americanus* Bloch = *Chætodon lanceolatus* Linnæus).

Equietus Rafinesque, Analyse Nat., etc., 1815, 86 (substitute for *Eques*, the latter name being considered too short).

Pareques (Gill) Goode, Bull. U. S. Nat. Mus., V, 1876, 50 (type *Grammistes acuminatus* Bloch & Schneider).

Body oblong, compressed; the back much elevated anteriorly, rapidly tapering to the caudal peduncle; mouth small, inferior, the lower jaw included; snout with evident slits and pores; teeth all in broad villiform bands; gill-rakers short; preopercle with a serrated membranous border; dorsal fin very long; anal small; interneurals closely wedged in behind occiput.

KEY TO THE SPECIES.

a. Body with lengthwise streaks; scales large, in 56 to 65 transverse series above lateral line. *acuminatus*, p. 677.

aa. Body without lengthwise streaks; scales small, in 83 to 93 transverse series above lateral line. *viola*, p. 678.

493. Eques acuminatus (Bloch & Schneider).

Grammistes acuminatus Bloch & Schneider, Syst. Ichth., 1801, 184 (no locality given).

Eques lineatus Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 169 (Brazil).

Eques acuminatus Castelnau, Anim. Nouv. Rares Amér. Sud, 1855, 10; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1487.

Pareques acuminatus Goode, Bull. U. S. Nat. Mus., V, 1876, 50.

Head 3.2; depth 2.9 to 3.1; D. VIII-I to X-I, 38 to 40; A. II, 6 or 7; scales in 56 to 65 transverse series above lateral line.

Body deep, much compressed; the back strongly elevated; anterior profile steep, but nearly straight; head compressed; snout blunt, not protruding beyond premaxillaries, with pores and slits, its length 3.6 to 4.1 in head; eye 3.2 to 3.8; mouth horizontal; the maxillary reaching about middle of eye, 2.6 in head; tip of lower jaw with a small fleshy knob; both nostrils nearly round, the posterior one notably the larger; preopercle with a serrated membranous border; gill-rakers very short, 12, including rudiments, on lower limb of first arch; pseudobranchiæ well developed; teeth in wide bands in both jaws, the outer ones in upper jaw enlarged, those of lower jaw all of about equal size; scales rather large, strongly ctenoid; lateral line rather strongly arched, becoming horizontal on caudal peduncle; second dorsal, caudal and anal scaly; dorsal fins contiguous; spinous dorsal short, the anterior spines high, the second 1.45 to 1.8 in head; soft dorsal very long and rather low; caudal fin rounded; anal small, the second spine enlarged, as long as the longest soft rays, 1.95 to 2 in head; ventrals moderate; pectorals rather short, 1.55 in head.

Color brownish above, silvery below; sides with longitudinal whitish stripes; fins all dusky.

The species is here described from 3 specimens (U. S. Nat. Mus. collection), ranging from 115 to 200 mm. in length. These specimens are from Charleston, South Carolina; Jefferson, Florida, and Cuba.

Recorded from the south Atlantic coast of the United States, West Indies and Brazil. Not seen at Panama.

494. Eques viola Gilbert.

Eques viola Gilbert, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1486 (Panama); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 138, Pl. XXI, fig. 42.

Head 3.1 to 3.4; depth 2.75 to 3.1; D. IX to XI, 38 to 41; A. II, 7 or 8; scales in 83 to 92 vertical series above lateral line.

Body sharply compressed toward dorsal outline, widening below; the back much elevated; anterior profile steep and evenly convex; ventral profile little convex; head compressed, rather short; the snout blunt, projecting slightly beyond premaxillaries, with well developed pores and slits, its length 3.1 to 3.45 in head; eye 3.6 to 4.1; mouth horizontal, inferior; maxillary reaching about middle of pupil, 2.55 to 2.7 in head; lower jaw with a fleshy symphyseal knob; opercle ending in two concealed points; preopercle with its membranous edge finely crenulate; gill-rakers short, not much longer than posterior nostril, 8 to 10, more or less developed, below angle; pseudobranchiæ well developed; teeth in jaws in villiform bands, the outer ones in upper jaw enlarged, canine-like; scales small, ctenoid, covering head to anterior nostrils; opercular flap with numerous very small scales; spinous dorsal rather short, moderately elevated, the second spine 1.6 to 2 in head, the general outline nearly triangular; soft dorsal long, the rays increasing in length posteriorly, the longest rays about ⅔ as long as the longest dorsal spine; caudal fin slightly convex, the lower lobe a little longer than the upper; anal fin inserted slightly back of middle of soft dorsal, second anal spine strong, but not as long as the soft rays, 2.25 to 2.55 in head; ventrals and pectorals of about equal length, 1.5 to 1.6 in head, ventrals inserted just back of base of pectorals; soft dorsal, caudal and anal closely scaled; spinous dorsal, ventrals and pectorals with scales on membrane only.

Color varying from bluish brown to grayish; under parts usually with violet shades; under side of gill-covers yellowish green.

This species is here described from 6 specimens, ranging from 170 to 200 mm. in length. We have also examined a paratype.

Known only from Panama Bay. Our specimens were taken along the rocky shores of a group of small islands near Balboa.

177. Genus **Sciæna** Linnæus.

Sciæna Linnæus, Syst. Nat., Ed. X, 1758, 288 (type *Sciæna umbra* Linnæus).

Cheilotrema Tschudi, Fauna Peruana, 1846, 13 (type *Cheilotrema fasciatum* Tschudi).

Rhinoscion Gill, Proc. Ac. Nat. Sci. Phila., 1861, 78, 85 (type *Amblodon saturnus* Girard).

Callaus Jordan, in Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 395 (type *Corvina deliciosa* Tschudi).

Body moderately elongate, compressed; the back more or less elevated; mouth inferior, rather small; snout with conspicuous slits and pores; teeth in the jaws in bands, some of the outer ones enlarged; preopercle with a serrated membranous edge at all ages; gill-rakers short.

495. **Sciæna deliciosa** (Tschudi).

Corvina deliciosa Tschudi, Fauna Peruana, 1846, 8 (Peru).

Sciæna deliciosa Günther, Cat. Fish. Brit. Mus., II, 1860, 295; Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 406; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 132; Starks, Proc. U. S. Nat. Mus., 1906, 794.

Head 2.9 to 3.2; depth 3.25 to 3.7; D. IX-I or X-I, 22 or 23; A. II, 9 or 10; scales in 53 to 61 transverse series above lateral line.

Body moderately elongate and compressed; the back elevated; anterior profile gently convex; head large, moderately compressed; snout blunt, protruding, with conspicuous pores and slits, its length 3.8 to 4.15 in head; eye 4.8 to 5.8; mouth moderate, little oblique; premaxillaries anteriorly below level of lower margin of eye; maxillary reaching slightly past middle of eye, 2.7 to 2.9 in head; snout with conspicuous pores and slits; posterior nostril more or less half-moon shaped, with a small membranous flap in front; preopercle with a finely serrated membranous edge; gill-rakers short, 11 to 13 on lower limb of first arch; pseudobranchiæ large; teeth in the jaws in bands; some of the outer ones in upper jaw enlarged; none of the teeth in the lower jaw especially enlarged; scales rather large, strongly ctenoid; lateral line slightly arched, becoming straight at vertical of first anal spine; all the fins, except the spinous dorsal, scaly at base; lower half of soft dorsal rather densely scaled; spinous dorsal moderately elevated, the spines rather weak, the third the longest, 2.15 to 2.3 in head; soft dorsal long and rather low, the rays decreasing in length posteriorly; caudal lunate,

the upper lobe somewhat the longer; anal small, the second spine strong, but much shorter than the longest soft ray, 3.3 to 3.8 in head; ventrals moderate; pectorals long, reaching past tips of ventrals, 1.27 to 1.7 in head.

Color bluish gray or brownish above, silvery below; rows of scales with faint dark streaks; fins all more or less dusky; upper portion of axil black.

This species is here described from 6 specimens in the U. S. National Museum collection from Peru, ranging in length from 161 to 207 mm.

A common fish on the coast of Peru. Recorded from Panama by Jordan & Eigenmann. Not seen there by recent collectors.

178. Genus **Nebris** Cuvier & Valenciennes.

Nebris Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 149 (type *Nebris microps* Cuvier & Valenciennes).

Body elongate, tapering backward; skull very cavernous, spongy to the touch; interorbital space broad; mouth large, oblique; lower jaw projecting; teeth subequal, in bands; eye very small; preopercle with a broad membranous border; slits and pores on snout little conspicuous; vertebræ 10 + 14; gill-rakers long and slender; scales small; air bladder with two long appendages; vertical fins scaly, the spines weak; lower pharyngeals separate, narrow.

KEY TO THE SPECIES.

a. Scales above lateral line in 80 to 95 transverse series; body with 6 or 7 conspicuous dark cross-bars. *microps*, p. 680.

aa. Scales above lateral line in 102 to 120 transverse series; body without dark cross-bars. *occidentalis*, p. 681.

496. **Nebris microps** Cuvier & Valenciennes.

Nebris microps Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 149, Pl. CXII (Surinam); Vaillant, Bull. Mus. Hist. Nat. Paris, III, 1897, 124; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1417; Vaillant, Nouv. Arch. Mus. Hist. Nat. Paris, 4 sér., II, 1900, 135, Pl. VII, figs. 4, 4a, 4b, 4c; Starks, Leland Stanford Jr. Univ. Pub., Univ. Ser., 1913, 50.

This species was not seen by us. We quote the following from Starks, "The Fishes of the Stanford Expedition to Brazil," 1913, p. 50.

"Four large specimens of this species were taken at Pará, each of them a little over a foot in length. This makes a direct comparison between this species and its representative in the Pacific, *Nebris occidentalis* Vaillant, for the first time possible.

"Comparing them with some specimens from Panama of similar size the mandible is strikingly weaker and does not protrude nearly so much, lacking the large, sharp process at the symphysis. The lips are thinner and the mouth is less oblique. There are 95 series of scales above the lateral line, counting the nearly vertical series, and 11 scales between the lateral line and the front of the soft dorsal. These counts in *Nebris occidentalis* are respectively 115 and 20. The scales on the belly are very much larger in *Nebris microps*. The pectoral is shorter, or 1⅕ in the head, while in the other species it is almost equal to the head. The radiating striations on the preopercle are not nearly so coarse and do not end in such coarse pectinate processes. The body is marked with 6 or 7 wide, conspicuous, dark cross bars, which are not evident in *Nebris occidentalis* and have not been described.

"The following is the color of fresh specimens. The back is dusky drab, with wide, nearly black, cross bars, anteriorly not so wide as the interspaces, posteriorly more crowded and equal to them. There is a trace of one over the opercle, one under the spinous dorsal, four under the soft dorsal, the first of which is under the 8th to the 11th rays, and the last under the last rays, and one across the caudal peduncle. The lower parts are very bright chrome yellow, or sometimes deep orange, being brightest on the head. The ventrals, pectorals and anal are bright yellow or orange, the first two growing coal black toward their points, and the anal dusky with dots. The dorsal rays grow dark toward the edge of the fin, and the caudal is slightly yellow, obscured by dark points."

This species inhabits the sandy shores of the Atlantic coast of northern South America; recorded from Guiana and Brazil. Not seen by us on the coast of Panama.

497. Nebris occidentalis Vaillant.

Nebris occidentalis Vaillant, Bull. Mus. Hist. Nat. Paris, III, 1897, 124; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 122.

Nebris zestus Jordan & Starks, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1417.

Head 3.4 to 3.7; depth 3.8 to 4.1; D. VI to IX, 25 to 29; A. II, 11 or 12; scales 102 to 120 in a transverse series above lateral line.

Body long, tapering posteriorly, scarcely compressed; the dorsal and ventral outlines about evenly curved; head long and rounded, the bones excessively cavernous, spongy; interorbital space wide, 2.5 to 2.8 in length of head; mouth large, oblique; the lower jaw projecting; premaxillaries anteriorly on level with upper margin of eye; maxillary reaching posterior margin of eye, 2 to 2.2 in head; snout and chin without slits and pores; snout 3.5 to 3.8 in head; a small knob at chin; eye 8 to 9.3 in head; preopercle with a wide crenulate membranous border; gill-rakers rather long and slender, the longest as long as the very small eye, 13 to 15 on the lower limb of the anterior arch; pseudobranchiæ very small; teeth in upper jaw at sides in villiform bands, those in lower jaw in a single series, none of them much enlarged, no canines; scales small, those on lower part of sides ctenoid, smooth elsewhere, those on head larger than on body, those of lateral line enlarged, covered with smaller scales; lateral line not arched anteriorly; alimentary canal very short; stomach with 9 small, slender, blind appendages; air bladder tapering rapidly posteriorly, coming to a sharp point, anteriorly with two appendages which curve backward and extend along lateral side of bladder and back to side of about middle of base of anal, where they become very small, suddenly recurving, following their original course and extending to cranium at sides; spinous dorsal very small, the spines very weak; soft dorsal long and low, the rays decreasing in length posteriorly; caudal fin rounded, the middle rays somewhat produced; anal spines very weak, scarcely distinguishable; ventrals rather short, reaching about half way from their base to vent in the rather large specimens before us; pectorals large, reaching much beyond tips of ventrals, 1 to 1.2 in head; vertical fins densely scaled.

Color grayish brown above, silvery below; sides with brownish punctulations; dorsals, caudal and pectorals dusky; anal and ventrals usually with brown points, yellowish in life.

This species is here described from 10 specimens, ranging in length from 300 to 350 mm. Besides these we have at hand two immature specimens, respectively 42 and 50 mm. in length, taken at Chame Point by Mr. Robert Tweedlie. In these the head is extremely large and excessively spongy to the touch, the body is notably compressed and the caudal peduncle very slender. The fins are very large, the pectorals and caudal being much longer than the head.

Known from the west coast of Central America. Our specimens were taken at Chame Point, Balboa and in the Panama City market.

179. Genus **Larimus** Cuvier & Valenciennes.

Larimus Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 145 (type *Larimus breviceps* Cuvier & Valenciennes).

Amblyscion Gill, Proc. Ac. Nat. Sci. Phila., 1863, 165 (type *Amblyscion argenteus* Gill).

Monosira Poey, Ann. Soc. Españ. Hist. Nat., X, 1881, 326 (type *Monosira stahli* Poey).

Body rather robust, compressed; skull firm, not greatly cavernous; upper jaw with the usual slits and pores little developed; no canines, and no barbels; snout very short; the mouth large, the gape very oblique or even vertical; preopercle with membranous edge, without bony teeth; pseudobranchiæ well developed; second dorsal fin long; anal fin short; gill-rakers long and slender; vertebræ 10 + 14.

KEY TO THE SPECIES.

a. Mouth large, the cleft vertical; tip of lower jaw on level with upper margin of pupil; maxillary reaching to anterior margin of pupil, 1.75 to 1.85 in head; eye small, 3.9 to 4.65 in head; gill-rakers 16 or 17 below angle on anterior arch; no distinct lines along the rows of scales. *argenteus*, p. 684.

aa. Mouth more or less oblique, never vertical; tip of lower jaw below level of upper margin of pupil; maxillary reaching past anterior margin of pupil; gill-rakers 18 to 21 below angle on anterior arch; upper parts with dark streaks along the rows of scales.

b. Mouth very oblique; snout very blunt; maxillary not reaching past middle of pupil; upper parts with rather faint lines along the rows of scales.

c. Mouth small, the cleft very oblique, but not quite vertical; tip of lower jaw on level with middle of pupil; maxillary reaching slightly past anterior margin of pupil, 2 to 2.1 in head; snout very short, 5.5 to 6 in head; rows of scales between lateral line and dorsal parallel with longitudinal axis of body; gill-rakers 18 or 19 below angle on anterior arch; gill-covers mostly black underneath. *effulgens*, p. 685.

cc. Mouth large, the cleft a little less oblique; tip of lower jaw on level with lower margin of pupil; maxillary reaching to middle of pupil, 1.8 to 2 in head; snout rather long, 4.2 to 5 in head; rows of scales between lateral line and spinous dorsal running obliquely upward and backward; gill-rakers 20 or 21 below angle on anterior arch; gill-covers dusky in pseudobranchial region only. *breviceps*, p. 686.

bb. Mouth not very oblique, more nearly horizontal; the snout somewhat tapering; maxillary reaching past middle of pupil; upper parts with conspicuous dark streaks along the rows of scales.

d. Mouth still notably oblique; tip of lower jaw slightly below level of middle of pupil; maxillary reaching slightly past middle of pupil; gill-rakers 19 or 20; ventral fins long, reaching to vent. *acclivis*, p. 687.

dd. Mouth less oblique; tip of lower jaw slightly below level of lower margin of pupil; maxillary reaching to posterior margin of pupil; gill-rakers 18 below angle on anterior arch; ventral fins short, not reaching to vent. *pacificus*, p. 687.

498. Larimus argenteus (Gill).

Amblyscion argenteus Gill, Proc. Ac. Nat. Sci. Phila., 1863, 165 (west coast of Central America).

Larimus argenteus Jordan & Gilbert, Bull. U. S. Fish Comm., II, 1882 (1883), 110; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1421, Pl. CCXXI, fig. 565; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 123.

Head 3.4 to 3.8; depth 2.9 to 3.25; D. X-I, 27 to 29; A. II, 6; scales 50 to 55.

Body compressed, rather robust; the back little elevated; profile from tip of snout to first dorsal spine evenly and very gently convex; mouth large, the cleft vertical; tip of lower jaw on level with upper margin of pupil; maxillary extending to anterior margin of pupil, 1.75 to 1.85 in head; eye small, 3.9 to 4.65 in head; snout rather long, its length 4.5 to 5 in head; cheeks very wide and deep; preopercle with a ciliated membranous edge; gill-rakers long, 1.33 in eye, 16 or 17 below angle on anterior arch; teeth minute, firm, in a single series in each jaw; rows of scales above lateral line running obliquely upward and backward; dorsal fins deeply notched, contiguous, the spines long and flexible; middle rays of caudal the longest, lateral line extending to their tips; anal fin small, the second anal spine strong, but shorter than soft rays, 1.8 to 2.9 in head; pectorals reaching well past vent, a little longer than head; ventrals reaching to or almost to vent.

Color bluish above; sides silvery; pale below; snout dusky; a dark axillary spot; dorsal, caudal and pectorals pale to blue black; ventrals and anal greenish yellow; under side of gill-covers mostly black; a steel-blue opercular blotch; some of our specimens with faint dark stripes along the rows of scales. (Color description from field notes.)

Of this species 15 specimens, ranging in length from 140 to 230 mm., were taken. This species is easily separated from all the other forms of this genus by the vertical mouth, and by the absence of distinct dark streaks along the rows of scales on sides and back.

Known from Mazatlan to Panama. Our specimens are from Balboa and the Panama City market.

499. Larimus effulgens Gilbert.

Larimus effulgens Gilbert, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1421 (Panama); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 123, Pl. XVI, fig. 33.

Head 3.4 to 3.8; depth 2.8 to 3; D. X-I, 28 or 29; A. II, 6; scales 47 to 51.

Body compressed; the back little elevated; profile from tip of snout to first dorsal spine gently convex; mouth rather small, the cleft very oblique but not quite vertical; tip of lower jaw on level with middle of pupil; maxillary reaching slightly past anterior margin of pupil, 2 to 2.1 in head; eye large, 3.3 to 3.5 in head; snout very short, its length 5.5 to 6 in head; cheeks neither wide nor very deep; preopercle with serrated membranous edge; gill-rakers very long, 1.33 in eye, 18 or 19 below angle on anterior arch; teeth minute, firm, in one series in each jaw; rows of scales between lateral line and spinous dorsal parallel with longitudinal axis of body, oblique between lateral line and anterior third of soft dorsal, then again running parallel with longitudinal axis of body; dorsal fins deeply notched, contiguous, the spines rather high, flexible; middle rays of caudal fin the longest, lateral line extending to their tips; anal fin small, the second spine strong, but shorter than soft rays, 2.15 to 2.35 in head; pectorals long, reaching well past vent, a little longer than the head; ventrals reaching to vent, 1.2 in head.

Color grayish above, silvery below; faint dark streaks along the rows of scales on back and sides; a dark axillary spot; under sides of gill-covers mostly black; dorsal and caudal fin mostly dusky, the lower rays yellow; ventrals and anal orange yellow.

Here described from 5 specimens, ranging in length from 190 to 215 mm. Our collection contains only two specimens, which are all that were seen, although Gilbert & Starks report it as common at Panama. This species was originally described as having no dark streaks along the rows of scales. Our specimens, however, show these rather distinctly.

Known only from Panama Bay. Our specimens are from the Panama City market.

500. Larimus breviceps Cuvier & Valenciennes.

Larimus breviceps Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 146, Pl. CXI (San Domingo; Brazil); Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 375 (in part, not of Cuvier & Valenciennes); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1423; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 404 (Colon), and 1917, 132 (Colon).

Monosira stahli Poey, in Gundlach, Anal. Soc. Españ. Hist. Nat., X, 1881, 326, Pl. VI (Porto Rico).

Larimus stahli Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 376.

Head 3.2 to 3.65; depth 2.7 to 3; D. X-I, 27 or 28; A. II, 6; scales 46 to 50.

Body robust, compressed; the back moderately elevated; profile from tip of snout to first dorsal spine evenly convex; mouth large, the gape oblique; tip of lower lip on level with lower margin of pupil; maxillary reaching to middle of pupil, 1.8 to 2 in head; eye small, 3 to 3.9 in head; snout rather long, 4.2 to 5 in head; cheek rather wide, but not very deep; preopercle with a coarsely serrated membranous edge; gill-rakers long and slender, the longest 1.3 in eye, 20 or 21 below angle on anterior arch; teeth minute, firm, in one series in each jaw; rows of scales above lateral line without compound curve, running obliquely upward and backward; dorsal fins notched to the base, separate, the spines high, very slender and flexible; middle rays of caudal fin the longest, lateral line extending to their tips; anal fin small, the second anal spine much enlarged, almost as long as soft rays, 1.7 to 2.1 in head; pectoral fins reaching past vent, equal to length of head; ventrals rather short, reaching to vent.

Color brown above, silvery below; dark streaks along the rows of scales on back and sides; a dark axillary spot; under sides of gill-covers dusky in pseudobranchial region only; dorsal, caudal and pectorals dusky; anal and ventral fins yellowish.

Of this rather abundant species 55 specimens, ranging in length from 60 to 235 mm., were preserved.

Known from the West Indies south to Brazil. Our specimens are from Toro Point; Mindi Reef; Fox Bay, Colon; Colon Reef, and Colon market.

501. Larimus acclivis Jordan & Bristol.

Larimus acclivis Jordan & Bristol, in Jordan & Evermann, Bull., U. S. Nat. Mus., XLVII, 1898, 1422 (San Juan Lagoon, Sonora); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 124, Pl. XVII, fig. 34.

Head 3.3 to 3.5; depth 2.7 to 3.1; D. X-I, 26 to 29; A. II, 6; scales 46 to 52.

Body robust, compressed; the back elevated; profile from snout to origin of spinous dorsal evenly convex; mouth rather large, the cleft quite oblique; tip of lower jaw slightly below level of the middle of pupil; maxillary reaching slightly past middle of pupil, 1.9 to 2.1 in head; snout very short, its length 4.9 to 5.4 in head; eye 3.3 to 3.5; the cheeks rather wide, but not very deep; preopercle with a finely serrated membranous margin; gill-rakers long and slender, 1.25 in eye, 19 or 20 below angle on anterior arch; teeth very small, firm, in one series in each jaw; rows of scales above lateral line anteriorly running obliquely upward and backward, often with a compound curve; dorsal fins deeply notched, contiguous, the spines weak and flexible; middle rays of caudal fin the longest, lateral line extending to tip of these rays; anal fin small, second anal spine strong, but shorter than soft rays, 1.75 to 2.35 in head; pectoral fins long, reaching past anal opening, as long as head; ventrals reaching vent.

Color brownish above, silvery below; conspicuous dark brown lines along the rows of scales on back and sides; a dark axillary spot; mouth mostly yellow; dorsal fin brownish, with little green; other fins all yellowish. (Color description from field notes.)

This species is here described from 12 specimens, ranging in length from 180 to 260 mm.

Known from Sonora, Mexico, south to Panama. Our specimens are from Balboa and the Panama City market.

502. Larimus pacificus Jordan & Bollman.

Larimus pacificus Jordan & Bollman, Proc. U. S. Nat. Mus., 1889, 161 (Albatross Sta. No. 2802; 8° 38′ N.; 79° 31′ W.; between Panama and the Galapagos Islands); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1424; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 124.

Head 3.15; depth 2.95; D. X-I, 27; A. II, 6; scales 50.

Body robust, compressed; the back moderately elevated; profile evenly convex from snout to first dorsal spine; mouth moderate, the cleft less oblique than in any of the other species of this genus; tip

of lower jaw below level of lower margin of pupil; maxillary reaching to posterior margin of pupil, 2 in head; eye rather small, 3.55 in head; snout long, 4.75 in head; preopercle with a serrated membranous edge; gill-rakers long, the longest equal to length of eye, 18 below angle on anterior arch; teeth minute, firm, in a single series in each jaw; rows of scales between lateral line and spinous dorsal parallel with the longitudinal axis of body; dorsal fins deeply notched, contiguous; the spines rather long, flexible; caudal fin with middle rays produced, lateral line extending to tip of these rays; anal fin short, the second anal spine enlarged, shorter than soft rays, 3 in head; pectorals reaching to vent, a little shorter than head; ventrals short, not nearly reaching to vent.

Color brownish above, silvery below; conspicuous dark streaks along the rows of scales on back and sides; a dark axillary spot present; fins all with more or less dusky; gill-covers mostly black underneath.

The species is here described from the type, a specimen 135 mm. long.

Recorded from Mazatlan, Punta Arenas, Panama, off the coast of Colombia, and Lobos de Tierra and Callao, Peru. Not seen at Panama by recent collectors.

180. Genus **Odontoscion** Gill.

Odontoscion Gill, Proc. Ac. Nat. Sci. Phila., 1862, 18 (type *Corvina dentex* Cuvier & Valenciennes).

Preopercle without plectroid spine, unarmed; canine teeth present, small; pseudobranchiæ present; gill-rakers rather long and slender; second anal spine not much enlarged.

KEY TO THE SPECIES.

a. Teeth in each jaw in a single series; rows of scales with faint dark streaks; a dark axillary spot present; dorsal spines usually XII-I, rarely XIII-I, soft rays 23 to 25. *dentex*, p. 688.

aa. Teeth in each jaw in two series; rows of scales with prominent dark streaks, at least below the lateral line; no axillary spot; dorsal spines usually XI-I, occasionally XII-I, soft rays 25 to 27. *xanthops*, p. 690.

503. **Odontoscion dentex** (Cuvier & Valenciennes).

Corvina dentex Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 139. Pl. CIX (San Domingo).

Larimus dentex Günther, Cat. Fish. Brit. Mus., II, 1860, 269.

Odontoscion dentex Poey, Syn. Pisc. Cub., 1868, 325; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1425.

Head 2.9 to 3.3; depth 3 to 3.4; D. XII-I or XIII-I, 23 to 25; A. II, 9; scales 6-50 to 58, counting transverse series above lateral line.

Body compressed; the back elevated; anterior profile rather straight; ventral outline little rounded; head compressed, the cheeks vertical; eyes large, varying greatly among individuals, 2.9 to 3.3 in head; interorbital space narrow, 3.8 to 4.4 in head; snout short, not projecting beyond premaxillaries, 3.8 to 4.4 in head; mouth large, oblique; the premaxillaries anteriorly on level with middle of eye; maxillary reaching past middle of eye, 1.9 to 2.1 in head; slits and pores on snout obsolete; preopercle with a crenulate margin, no distinct teeth; gill-rakers slender, 14 to 17 on lower limb of anterior arch; pseudobranchiæ well developed; teeth in the jaws in a single series; lower jaw with two canines at tip and some enlarged canine-like teeth at sides; some of the teeth in upper jaw enlarged but not as large as the lower ones; scales thin, smooth on head, elsewhere ctenoid; lower pharyngeal teeth separate, some of them enlarged, conical, the upper teeth blunt; stomach with 7 cæca; air bladder with two short horns anteriorly which unite at the base, being connected with the main air bladder only by a very small opening; dorsal spines weak and flexible, the longest 1.6 to 2.1 in head; soft dorsal moderately elevated, as high as the spinous dorsal, the rays decreasing in length rather rapidly posteriorly; caudal subtruncate, the upper lobe the longer; anal fin rather small, the second spine not much enlarged, shorter than the soft rays, 2.4 to 2.7 in head; ventrals reaching about half way to anal; pectorals short, not nearly reaching tips of ventrals, 1.6 to 1.75 in head; vertical fins densely scaled.

Color brownish, with silvery below; everywhere with brown dots; faint streaks along the rows of scales; some specimens much darker than others; tip of snout and margin of lower jaw black; a dark axillary spot present; fins all more or less dusky.

Of this species over 100 specimens were preserved, ranging in length from 80 to 155 mm.

Known from the West Indies, where it is said to reach a large size, and from Trinidad. No large specimens were seen on the Panama coast. It is very common on sandy and rocky shores. Our specimens are from Toro Point; Fox Bay, Colon; Colon Reef; Colon market, and Porto Bello.

504. Odontoscion xanthops Gilbert.

Odontoscion xanthops Gilbert, in Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1426 (Panama); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 124, Pl. XVII, fig. 35.

Head 3.2 to 3.45; depth 3.1 to 3.3; D. XI-I or XII-I, 25 to 27; A. II, 8 or 9; scales 6 or 6½-56 to 63, counting transverse series above lateral line.

Body elongate, compressed; dorsal and ventral outlines about evenly curved; head compressed; eye large, 3.35 to 3.85 in head; preorbital narrow; interorbital space moderate, 3.85 to 4.3 in head; snout short, not projecting beyond premaxillaries, its length 4 to 4.7 in head; mouth large, oblique; the lower jaw usually slightly projecting; premaxillaries anteriorly about on level with lower margin of pupil; maxillary usually reaching well past middle of eye, 2.05 to 2.2 in head; slits and pores on snout and lower jaw little evident; chin with a small knob; preopercular margin without distinct spines, crenulate; gill-rakers rather long and slender, 14 or 15 on lower arm of anterior arch; pseudobranchiæ large; teeth on the lower jaw in 2 series, the inner ones enlarged, with canines directed backward at the tip; upper jaw with an outer row of enlarged teeth and a band of small inner teeth, with considerable space between the two; teeth smaller than in *O. dentex;* scales rather large, smooth on head, elsewhere weakly ctenoid; stomach with 5 cæca; air bladder tapering and coming to a sharp point posteriorly, anteriorly with two short horns united at the base and connected with the main air bladder only by a very small opening; vertical fins scaly; dorsal spines weak and flexible, none of them thickened, the longest 1.5 to 2 in head; soft dorsal rather high anteriorly, the rays decreasing rapidly in length posteriorly, with a distinct scaly sheath at base; caudal subtruncate, the upper lobe slightly the longest, with acute angle, the lower lobe slightly rounded; anal small, the second spine rather strong, 2.3 to 2.75 in head; ventrals moderate, not nearly reaching vent; pectorals not reaching tip of ventrals, 1.55 to 1.9 in head.

Color brownish above, paler below; everywhere with brown dots; lower parts with silvery reflections; dark streaks along the rows of scales, these narrow and somewhat obscure above lateral line, but wide and distinct below lateral line, where they are horizontal; fins all dusky; anal and tips of ventrals black.

This species is here described from ten specimens, ranging in length from 145 to 185 mm.

Previously known only from one specimen from Panama Bay. Our specimens are from Panama Bay, Balboa, and Panama City market.

181. Genus **Corvula** Jordan & Eigenmann.

Corvula Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 377 (type *Johnius batabanus* Poey).

This genus differs from *Bairdiella* in having the preopercular margin unarmed. From *Odontoscion* it differs in the absence of canine teeth. A comparison of *O. xanthops* and *C. macrops,* however, shows almost a complete intergradation.

KEY TO THE SPECIES.

a. Body robust, rather deep, the depth 2.8 to 2.9 in length; anal rays II, 10 or 11; coloration dark brown, with wide streaks along the rows of scales below lateral line; anal and ventrals black. *macrops,* p. 691.

aa. Body oblong, the depth 3 to 3.3 in length; anal rays II, 9; coloration grayish above, silvery below; streaks along the rows of scales narrow, composed of dark spots on the scales; anal and ventrals pale or with few dusky punctulations. *sanctæ-luciæ,* p. 692.

505. **Corvula macrops** (Steindachner).

Corvina macrops Steindachner, (Sitzb. k. Ak. Wiss. Wien, LXXII) Ichth. Beitr., III, 1875, 24, Pl. II (Panama).

Sciæna macrops Jordan & Gilbert, Bull. U. S. Fish Comm., I, 1881 (1882), 316.

Corvula macrops Jordan & Eigenmann, Rept. U. S. Fish Comm., XIV, 1886 (1889), 379; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 125.

Head 3.2 to 3.45; depth 2.8 to 2.9; D. XI-I or XII-I, 23 to 26; A. II, 10 or 11.

Body rather robust, moderately compressed; the back elevated; the dorsal outline more strongly curved than the ventral; head compressed, rather deep; interorbital space narrow, 4 to 4.45 in head; snout short and very blunt, slightly overhanging premaxillaries, with small slits and pores, its length 4.45 to 4.6 in head; eye 3.3 to 3.5; mouth large, oblique; the premaxillaries anteriorly about on level with lower margin of eye; maxillary reaching posterior margin of pupil, 2 to 2.1 in head; the chin soft and fleshy, without a knob; preopercular margin crenulate, without spines; gill-rakers long and slender, 14 on lower limb of anterior arch; pseudobranchiæ well developed; teeth small, no canines, those of the lower jaw mostly in two series, none of them notably enlarged; teeth in upper jaw much as in *Odontoscion xanthops* but

smaller, the outer row slightly enlarged, the inner band of very small teeth, these separated from the outer row by considerable space; scales rather large, smooth on head, elsewhere ctenoid; spinous dorsal moderately elevated, the spines weak and flexible, none of them thickened, the longest 1.6 to 1.95 in head; soft dorsal with a distinct scaly sheath at base, the rays decreasing in length posteriorly; caudal subtruncate, the upper lobe slightly the longest, with an acute angle, the lower lobe somewhat rounded; anal fin rather large, the second spine rather strong, 2.15 to 2.3 in head; ventrals rather long, but not reaching vent; pectorals short, not nearly reaching tips of ventrals, 1.45 to 1.65 in head.

Color dark brownish above, paler with silvery below; body everywhere with brown dots; rows of scales with dark streaks, prominent below lateral line; dorsals, caudal and pectorals dusky; anal and ventrals black.

One specimen, 180 mm. long, was secured. The above description is based on this and three smaller specimens from Acapulco, Mexico.

Known from the Pacific coast of tropical America, from Mazatlan to Panama. Our specimen is from the rocky shores of a small island near Balboa.

506. Corvula sanctæ-luciæ Jordan.

Corvula sanctæ-luciæ Jordan, Proc. U. S. Nat. Mus., 1889, 649 (Port Castris, St. Lucia); Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1429; Evermann & Marsh, Bull. U. S. Fish Comm., XX, Pt. I, 1900 (1902), 217.

Head 2.9 to 3.3; depth 3 to 3.3; D. XI-I, 22 or 23; A. II, 9.

Body oblong, moderately compressed; the back elevated; profile straight over eyes; ventral outline rounded; head short; snout rather blunt, not protruding beyond premaxillaries, with small slits and pores, its length 3.8 to 4.5 in head; eye 3.1 to 3.9; mouth large, oblique, the jaws equal; premaxillaries anteriorly about on level with lower margin of pupil; maxillary reaching posterior margin of pupil, 2 to 2.15 in head; chin without knob; preopercular margin with a crenulate membranous edge; gill-rakers long and slender, 13 to 16 on lower limb of anterior arch; pseudobranchiæ well developed; teeth small, no canines, those in lower jaw in a single series, unequal; upper jaw with a series of somewhat enlarged outer teeth, and a band of very small inner ones; scales rather large, smooth on head, elsewhere ctenoid; lower pharyngeal teeth separate, villiform, the upper ones in two somewhat triangular, widely separated villiform patches; stomach with

7 cæca; air bladder tapering posteriorly, coming to a sharp point, anteriorly with two short horns, united at base, and connected with the main body of air bladder by a small opening; spinous dorsal moderately elevated, the spines weak and flexible, none of them thickened; soft dorsal rather low, the rays decreasing in length posteriorly; caudal subtruncate, the upper lobe with an acute angle, the lower slightly rounded; anal moderate, the second spine not much enlarged, variable, 2.4 to 3.4 in head; ventrals rather short, not nearly reaching vent; pectorals short, not reaching tips of ventrals, 1.45 to 1.7 in head.

Color grayish to steel-blue above, silvery below; rows of scales on sides and back with faint dark streaks, these not quite continuous, formed by a dark spot on each scale; fins usually all more or less dusky; anal, ventrals and pectorals often pale, with dusky punctulations.

One hundred specimens, ranging from 60 to 170 mm. in length, were preserved. This species is abundant on both rocky and sandy bottom at Colon. It apparently differs from *C. subequalis* in having a larger mouth and fewer dorsal spines; from *C. batabana* it differs in having fewer dorsal rays and in coloration. *C. batabana* has more intense and continuous dark stripes along the rows of scales which are not broken into spots as in *C. sanctæ-luciæ*. *C. subequalis* and *C. batabana* are two related West Indian forms. The present species, although rather small, is a food fish of some importance on the Isthmus.

Known from Porto Rico south to Panama. Previously recorded only from Porto Rico and Cuba. Our specimens are from Toro Point; Fox Bay, Colon; Colon Reef, and Colon market.

Family LX. Pomacentridæ.

The Desmoiselles.

Body usually short and deep, compressed; mouth small, nearly always terminal; nostril single; teeth in the jaws either conic or incisor-like, in one or more series or in bands, vomer and palatines toothless; preopercle serrate or entire; suborbital sheathing the maxillary, its lower margin free or adnate to the cheek; lower pharyngeals fully united; branchiostegals 5 to 7; gills 3½, the slit behind the last very small or obsolete; gill-membranes free from the isthmus, the rakers long or short; air bladder present; scales usually large, ctenoid, present on entire body or wanting on snout; lateral line ending under soft dorsal; dorsal fin long, continuous, with numerous strong spines, the

spinous portion longer than the soft part, the latter scaly, usually more or less elevated; anal fin with 2 spines, the soft portion similar to that of the dorsal; ventral fins thoracic, with I, 5 rays. A family of rather small, brilliantly colored fishes, living mostly on coral reefs and among rocks where they feed on small animals and plants. Most of the species vary markedly in color with age. Five genera and 9 species are represented in the Panama collection. In one case the same species occurs on both sides of the Isthmus and in other instances the species from the opposite sides are so closely related that they can be separated only with great difficulty.

KEY TO THE GENERA.

a. Body elongate, the depth more than 2 in the length; teeth in the jaws conical, in bands, the outer ones enlarged. *Chromis,* p. 694.

aa. Body deep, ovate, the depth always less than 2 in length; teeth in one or two series, compressed, more or less incisor-like.

b. Teeth rather large, immovable, of about equal size in each jaw, usually truncate or more or less notched; suborbital narrow or rather broad, without a deep notch between nostril and maxillary.

c. Preopercle and suborbital distinctly serrate; teeth with straight or slightly truncate margins, never distinctly notched; snout mostly scaly. *Pomacentrus,* p. 697.

cc. Preopercle and suborbital entire; teeth always with distinctly notched margins; scales wanting on snout.

d. Suborbital with its lower margin free; mouth oblique, terminal, the lips thin. *Abudefduf,* p. 700.

dd. Suborbital adnate to the cheek; mouth lower, slightly inferior, the lips thick. *Nexilarius,* p. 704.

bb. Teeth smaller, movable, those in upper jaw close set, compressed, with entire margins, those in the lower jaw larger anteriorly, much reduced at sides; suborbital very broad, with a deep notch between nostril and maxillary. *Microspathodon,* p. 705.

182. Genus **Chromis** Cuvier.

Chromis Cuvier, Memoir. Mus. Hist. Nat. Paris, I, 1815, 393 (type *Sparus chromis* Linnæus).

Heliases Cuvier, Règne Animal, Ed. II, II, 1829, 180, 495 (type, not indicated, *Heliases insolatus* Cuvier & Valenciennes).

Furcaria Poey, Memorias, II, 1860, 194 (type *Furcaria puncta* Poey).

Ayresia Cooper, Proc. Cal. Ac. Sci., III, 1863, 73 (type *Ayresia punctipinnis* Cooper).

Body oblong, the depth usually less than half the length; mouth small; teeth conical, in 2 or more series or in bands, the outer ones enlarged, blunt; gill-rakers rather numerous, slender; scales large, 24 to 33 in a lateral series; snout scaly nearly to the lips; dorsal spines 12 to 24; caudal fin forked.

KEY TO THE SPECIES.

a. Eye 3 to 3.35 in head; dorsal with 11 or 12 soft rays; anal with 10 or 11 rays; scales in transverse series 29 to 31; spot at base of upper rays of pectoral dark brownish, not very pronounced. *marginatus*, p. 695.

aa. Eye 3.45 to 3.9 in head; dorsal with 12 or 13 rays; anal with 11 or 12 rays; scales in transverse series 31 to 33; spot at base of pectoral black, very pronounced. *atrilobatus*, p. 696.

507. Chromis marginatus (Castelnau). (Plate LXIX, fig. 1.)

Heliasis marginata Castelnau, Anim. Nouv. Rares Amér. Sud, 1855, 9, Pl. III, fig. 1 (Bahia, Brazil).

Chromis marginatus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1546.

Head 3.3 to 3.9; depth 2.3 to 3.5; D. XII, 11 or 12; A. II, 10 or 11; scales 29 to 31.

Body elongate, tapering gradually backward, compressed; anterior profile not notably elevated, nearly straight over eyes, convex at nape; head moderate; snout tapering, its length 3.57 to 4.15 in head; eye 3 to 3.35; mouth small, terminal, oblique; the maxillary reaching to or slightly past anterior margin of eye; teeth in the jaws anteriorly in bands, in a single series at sides, the outer ones enlarged, conical; preopercle very finely serrate; suborbital coalesced with the cheek; gill-rakers rather slender, numerous, about 25 on lower limb of first arch; lateral line slightly arched, ending under the last rays of the dorsal; scales ctenoid, rather large, present on entire body; vertical fins with small scales at base; dorsal fin long, continuous, the spines short, not graduated, some of the median ones longer than the posterior ones, some of the rays of the soft part somewhat elevated, scarcely reaching base of caudal when deflexed; caudal fin deeply forked, both lobes strongly pointed, one of the rays on each lobe often filamentous; anal fin with 2 strong spines, the soft portion similar to that of the dorsal; ventral fins small, reaching to or slightly past the vent; pectoral

fins moderate, reaching slightly past the tips of the ventrals, equal to or slightly shorter than head.

Color in alcohol dark brownish above, silvery below; scales with dark margins; a yellow spot on caudal peduncle, under and behind last rays of dorsal, and an indication of a yellowish stripe along middle of sides, and narrower pale stripes along the rows of scales; dorsal fin black, except posterior rays, and with a narrow translucent margin; caudal fin with the outer half of each lobe black, narrowly margined with white, the middle rays plain translucent; anal fin mostly dusky, the posterior rays and the margin pale; ventral fins dusky, with pale tips; pectorals plain translucent, with a dark spot at base of upper rays, which may or may not extend all the way across the base of the fin, involving the axil.

This beautiful little fish is represented by 10 specimens, ranging from 95 to 125 mm. in length. A female taken on March 15, 1912, has the ovaries well distended with eggs, indicating that this species spawns in the spring. We have referred our specimens to *C. marginatus,* but we are of the opinion that further study will show that *C. multilineatus* (Guichenot), *C. cyaneus* (Poey) and *C. punctatus* (Poey) are all identical.

Known from Panama to Brazil. Our specimens are from Porto Bello.

508. Chromis atrilobatus Gill. (Plate LXIX, fig. 2.)

Chromis (*Furcaria*) *atrilobata* Gill, Proc. Ac. Nat. Sci. Phila., 1862, 149 (Cape San Lucas).

Chromis atrilobatus Gill, Proc. Ac. Nat. Sci. Phila., 1863, 220; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1546; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 139, Pl. XXI, fig. 43 (Panama Bay); Kendall & Radcliff, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 136 (Toboguilla Island; Acapulco).

Head 3.2 to 3.6; depth 2.25 to 2.7; D. XII, 12 or 13; A. 11 or 12; scales 31 to 33.

This species is very closely related to *C. marginatus* but differs from it in several minor characters. The eye is somewhat smaller, in 7 specimens, ranging from 95 to 135 mm. in length, it is contained 3.45 to 3.9 in head. In a similar series of *C. marginatus* the eye is contained 3 to 3.35 in head. When specimens of like size are compared this difference is at once noticeable. The dorsal and anal fins are slightly longer and the scales are a little smaller, as shown by the enumerations of a series of 10 specimens given above.

Our Pacific coast specimens are somewhat darker in color than the Atlantic ones, and the dark spot at the base of the upper rays of the pectoral is larger and much more pronounced. In other respects the color markings are identical.

Of this beautiful little fish we have 48 specimens, ranging in length from 70 to 135 mm. Females taken on March 27, 1912, have the ovaries well distended with eggs, indicating that the spawning season occurs in the spring. It is a rather common species about the small islands near Panama City.

Known from Cape San Lucas to Panama Bay and the coast of Peru. Our specimens were taken near Balboa.

183. Genus **Pomacentrus** Lacépède.

Pomacentrus Lacépède, Hist. Nat. Poiss., IV, 1803, 505 (type *Chætodon pavo* Bloch).

Pristotis Rüppell, Neue Wirbelthiere, 1835, 128 (type *Pristotis cyanostigma* (Rüppell).

Parapomacentrus Bleeker, Nat. Verh. Holl. Maats. Weten., II, 1877, 65 (type *Parapomacentrus polynema* Bleeker).

Amblypomacentrus Bleeker, Nat. Verh. Holl. Maats. Weten., II, 1877, 68 (type *Pomacentrus breviceps* Bleeker).

Eupomacentrus Bleeker, Nat. Verh. Holl. Maats. Weten., II, 1877, 73 (type *Pomacentrus lividus* Bleeker).

Brachypomacentrus Bleeker, Nat. Verh. Holl. Maats. Weten., II, 1877, 73 (type *Pomacentrus albifasciatus* Bleeker).

Body ovate, compressed; the anterior profile steep, convex; head short and deep; snout blunt; mouth small, terminal; each jaw with one or two series of close set, compressed, immovable teeth, with straight or truncate margins, never distinctly notched or bifid; preopercle and suborbital serrate; gill-rakers moderate; scales large, ctenoid, present on entire body, except a small area about the mouth; dorsal fin long, continuous, scaly at base, with 12 or 13 short graduated spines, the soft part more or less elevated; caudal fin moderately forked, the lobes rounded; anal fin with 2 strong spines, the soft portion similar to that of the dorsal. We refer our specimens to two doubtfully distinct species. The species appear to be much confused and the entire genus shows need of revision.

KEY TO THE SPECIES.

a. Anal fin with 12 or 13 rays; head usually with many small accessory scales. *rectifrænum*, p. 698.

aa. Anal fin with 13 or 14 rays, the usual number being 14; head with few or no small accessory scales. *fuscus*, p. 699.

509. Pomacentrus rectifrænum (Gill).

Pomacentrus rectifrænum Gill, Proc. Ac. Nat. Sci. Phila., 1862, 148 (Cape San Lucas); Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 140 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 126 (Acapulco; Toboguilla and Perico islands).

Pomacentrus flavilatus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 148 (Cape San Lucas); Boulenger, Bull. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 3 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 131 (Acapulco and Perico Islands).

Pomacentrus analigutta Günther, Cat. Fish. Brit. Mus., IV, 1862, 27 (Cape San Lucas; after Gill, MS.).

Eupomacentrus rectifrænum Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1553.

Pomacentrus rectifrenum Boulenger, Boll. Mus. Zoöl. Anat. Torino, XIV, No. 346, 1899, 3 (Panama Bay).

Pomacentrus gilli Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 141, Pl. XXII, fig. 44 (Panama Bay); Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 128 (Acapulco; Toboguilla and Perico islands).

Head 2.9 to 3.4; depth 1.6 to 2.1; D. XII, 14 or 15; A. II, 12 or 13; scales 27 to 29.

Body deep, compressed; anterior profile rather steep, convex; head short; snout blunt; mouth small, terminal; the maxillary failing to reach eye in adult; teeth in a single continuous series in each jaw, flattened, incisor-like; preopercle serrate; suborbital rather broad, its free margin serrate, at least posteriorly; gill-membranes united, partly free from isthmus, the rakers short, 9 to 11 more or less developed on lower limb of first arch; lateral line arched, ending under the soft dorsal; scales large, ctenoid, covering nearly the entire body, only a small area about the mouth naked; vertical fins scaly, at least at base; dorsal fin long, its origin over posterior margin of opercle, the spines strong, graduated, the last one equal to length of snout and half the eye, the soft part short, its margin not strongly angulate; caudal fin moderately forked, both lobes rounded, the upper one the longer; anal

fin with 2 strong spines, the soft part similar to that of the dorsal; ventral fins moderate, the outer ray more or less produced; pectoral fins broad, 1 to 1.25 in head.

Color variable, brownish; the adults usually uniform in color, varying from light brown to very dark brown, but the young often marked with bluish spots and sometimes with bluish lines on head; scales with or without distinct black margins; a black ocellus present on the base of the anterior soft rays of dorsal which may persist until the fish reaches a length of 80 mm., but which more usually disappears earlier; upper surface of caudal peduncle with a dark blotch; the pectoral and caudal fins plain translucent in the young; in the adult the caudal fin becomes brownish like the dorsal, the pectorals remaining translucent or becoming brownish, with a dark spot at base of upper ray constantly present; anal and ventrals somewhat darker than the body.

We have 35 specimens of this species, ranging from 45 to 140 mm. in length. Besides these we have at hand quite a number of specimens taken in Panama Bay by the Albatross. We have also examined Dr. Gill's types of *P. rectifrænum, P. analigutta* and *P. flavilatus*. In the light of the study of this large amount of material, we refer *P. analigutta* and *P. flavilatus*, both of Gill, and *P. gilli* of Gilbert & Starks all to the present species. This fish is very common in the tide pools and among the rocks near Panama City and is used as food to a limited extent.

Known from Mazatlan south to Panama. Our specimens are from Taboga Island, Naos Island, Balboa, and the Panama City market.

510. Pomacentrus fuscus Cuvier & Valenciennes.

Pomacentrus fuscus Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 432 (Brazil).

?*Pomacentrus variabilis* Castelnau, Anim. Nouv. Rares Amér. Sud, 1855, 9, Pl. III, fig. 3 (Bahia, Brazil).

Eupomacentrus fuscus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1552; Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 405 (Colon).

Head 2.85 to 3.2; depth 1.7 to 2; D. XII, 14 or 15; A. II, 13 or 14, the usual number being 14; scales 26 to 28.

This species is scarcely separable from *P. rectifrænum*, the only constant difference noticed is the slightly longer anal fin in *P. fuscus*, which has 13 or 14 soft rays, the more usual number being 14. *P. rectifrænum* has 12 or 13 rays in the anal fin, the former number

occurring as frequently as the latter. The number of small accessory scales on the head is a very variable character, and probably of no specific importance, yet it is evident that these occur less frequently in the Atlantic specimens than in the Pacific ones. The color, while in general identical, is more uniformly dark brown in the Atlantic specimens. Blue spots are present on the head and base of anal of only a few specimens. The young bear the ocellus on the dorsal fin, and the black spots on the caudal peduncle behind the dorsal fin exactly as in *P. rectifrænum.*

This is a very common species among rocks and in tide pools on the Atlantic coast of Panama. Numerous specimens, ranging from 27 to 96 mm. in length, were preserved. We have referred our specimens to *P. fuscus.* We, however, do not understand the relationship of the Atlantic species. Owing to much individual variation, confusion has arisen, and the need of a thorough study and revision, based on a large series of specimens from various localities, is evident.

The probable range of this species extends from Florida to Brazil. Our specimens are from Toro Point, Colon and Porto Bello.

184. Genus **Abudefduf** Forskål.

Abu-defduf Forskål, Descr. Animal., 1775, 59 (type *Chætodon sordidus* Forskål).

Glyphisodon Lacépède, Hist. Nat. Poiss., IV, 1803, 542 (type *Glyphisodon moucharra* Lacépède = *Chætodon saxatilis* Linnæus).

Euschistodus Gill, Proc. Ac. Nat. Sci. Phila., 1862, 145 (type *Euschistodus declivifrons* Gill).

Body deep, compressed; head short; mouth small, terminal; preopercle and suborbital entire, the lower margin of the latter free, not adnate to the cheek; teeth in a single continuous series, flattened, more or less bifid; scales large, ctenoid, covering entire body, except snout; dorsal fin long, continuous, usually with 13 spines, the last ones shorter than the median ones. Two species were taken on the coast of Panama.

KEY TO THE SPECIES.

a. Scales moderate, 28 to 30 in a lateral series, 4 complete rows between lateral line and origin of dorsal; caudal fin deeply forked; all the lobes of the vertical fins strongly angulate; crossbars usually quite distinct, equal to or narrower than the interspaces. *saxatalis,* p. 701.

aa. Scales large, 26 to 28 in a lateral series, 3 complete rows between lateral line and origin of dorsal; caudal fin not deeply forked; the lobes of the vertical fins not angulate; cross-bars often indistinct, broader than the interspaces. *analogus*, p. 703.

511. Abudefduf saxatilis (Linnæus). (Plate LXX.)

Chætodon saxatilis Linnæus, Syst. Nat., Ed. X, 1758, 276 ("India").

Chætodon mauritii Bloch, Naturg. Ausl. Fische, III, 1787, 109, Pl. CCXIII, fig. 1 (Brazil; based on a drawing by Prince Maurice).

Chætodon marginatus Bloch, Naturg. Ausl. Fische, III, 1787, 98, Pl. CCVII (Martinique).

Chætodon sargoides Lacépède, Hist. Nat. Poiss., IV, 1803, 471, Pl. X, fig. 3 (Martinique; on a drawing by Plumier).

Glyphisodon moucharra Lacépède, Hist. Nat. Poiss., IV, 1803, 543 (Brazil, etc.).

Glyphisodon saxatilis Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 446; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 143 (Panama Bay).

Glyphidodon troschelii Gill, Proc. Ac. Nat. Sci. Phila., 1862, 150 (Cape San Lucas).

Abudefduf saxatilis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1561, Pl. CCXXXIV, fig. 590; Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 134 (Acapulco; Perico and Toboguilla islands, Panama Bay; Chatham Island).

Abudefduf declivifrons Kendall & Radcliffe, Memoir. Mus. Comp. Zoöl., XXXV, 1912, 135 (Perico and Toboguilla islands, Panama Bay); Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 410 (Panama).

Abudefduf mauritii Fowler, Proc. Ac. Nat. Sci. Phila., 1916, 405 and 410 (Colon; Panama), and 1917, 133 (Colon).

Head 2.75 to 3.45; depth 1.55 to 1.9; D. XII, 13 (rarely 12); A. II, 11 or 12 (rarely 10); scales 28 to 30.

Body deep, compressed; the back elevated; profile straight or slightly concave over eyes, strongly convex at nape; head short; snout blunt, its length 3.2 to 4.25 in head; eye 2.4 to 3.6; mouth small, terminal; the maxillary scarcely reaching anterior margin of eye in adult, slightly past anterior margin of eye in young; teeth in a single continuous series, flattened and slightly bifid; preopercle entire; suborbital very narrow, usually narrower than pupil even in adult, its

lower margin free; gill-membranes free from the isthmus, the rakers about half the length of eye in adult, 16 to 21 on lower limb of first arch; lateral line arched, ending below base of last rays of dorsal; scales large, present on head, except snout, 4 or 4½ rows between lateral line and origin of dorsal, 10 or 11 between lateral line and origin of anal; vertical fins with small scales; the dorsal and anal with a sheath of rather large scales at base; dorsal fin long, continuous, the spines strong, the longest equal to snout and half the eye in adult, the soft part shorter, strongly angulate in adult; caudal fin deeply forked, the lobes angulate, the upper one the longer; anal fin with 2 strong spines, the soft portion similar to that of the dorsal; ventral fins moderate, the outer ray produced, often filamentous; pectoral fins rather long, exceeding the length of head in the adult, equal to or shorter than head in young, 2.7 to 3.4 in length of body.

Color rather variable, some individuals much darker than others, ground color usually green; upper parts of head dusky; sides with 5 broad dusky bars, which are obscure in very dark specimens; pectorals light green with black axil, the other fins usually of the same color as the body; in the very young the pectorals, caudal, soft dorsal and anal are colorless, and the dusky bars on side are indistinct.

We have made a careful comparison of our material from the opposite coasts, but we are unable to detect any differences. We have over 200 specimens from the Pacific, ranging from 20 to 185 mm. in length and 61 from the Atlantic, which range in length from 25 to 155 mm. This species is very common in tide pools and on coral reefs on both coasts. We have examined specimens listed as *A. declivifrons* from Panama Bay by Kendall & Radcliffe, but we refer these to the present species. It indeed seems doubtful to us whether *A. declivifrons* can be retained as a valid species. This species is said to differ from *A. savatilis* principally in the broader suborbital. This proves to be a variable character; however, we have not found a specimen among our large series in which the suborbital is quite as greatly expanded as a specimen in the National Museum from Cape San Lucas, probably a paratype, which we have at hand for comparison. This fish is used as food to a limited extent.

Known from Lower California south to Peru and from Rhode Island to Uruguay. Our Pacific coast specimens are from Chame Point, Taboga Island, Naos Island, Balboa and Panama. Atlantic specimens are from Toro Point, Colon and Porto Bello.

512. Abudefduf analogus (Gill). (Plate LXXI.)

Euschistodus analogus Gill, Proc. Ac. Nat. Sci. Phila., 1863, 219 (Aspinwall, now Colon, Panama).

Abudefduf analogus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1563.

Abudefduf concolor Metzelaar, Over Tropisch Atlantische Visschen, Amsterdam, 1919, 99 (Dutch West Indies; not of Gill).

Head 2.7 to 3.35; depth 1.65 to 1.8; D. XIII, 12 or 13; A. II, 9 or 10; scales 26 to 28.

Body rather deep, compressed; the back moderately elevated; anterior profile gently convex; head short; snout blunt, its length 2.4 to 3.4 in head; eye 2.8 to 4.25; mouth small, terminal; the maxillary scarcely reaching anterior margin of eye; teeth in a single series, rather large, flattened and distinctly bifid; preopercle nearly entire; suborbital rather broad, as wide as half the eye in specimens 140 mm. in length, narrower than pupil in very young; gill-membranes free from the isthmus, the rakers short, 11 or 12 more or less developed on lower limb of first arch; lateral line arched, ending below base of last dorsal rays; scales large, present on head, except snout, 3 complete rows of scales between lateral line and origin of dorsal, 8 or 9 between lateral line and origin of anal; vertical fins with scales on base; dorsal fin long, continuous, the spines strong, the longest not greatly exceeding length of snout, the soft part short, not strongly angulate; caudal fin not very deeply forked, the lobes not angulate; anal fin with 2 strong spines, the soft portion similar to that of the dorsal; ventral fins moderate, the outer ray rarely produced; pectoral fins about equal to the length of head, 3.5 to 3.9 in length of body.

Color rather dark brown; young with cross-bars which are broader than the interspace, these becoming indistinct in adult; fins of the same color as the body; pectoral fin with black axil.

This species is represented by 20 specimens, ranging from 27 to 190 mm. in length. It may be distinguished from *A. saxatilis* by the more elongate teeth, less strongly forked caudal fin, the rounded lobes of the vertical fins and by the broader and less distinct cross-bars.

This species is known only from the Atlantic coast of Panama. Our specimens were taken at Toro Point and Colon.

185. Genus **Nexilarius** Gilbert.

Nexilarius Gilbert, in Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 512 (misprinted *Nexilaris*; type *Euschistodus concolor* Gill).

This genus differs from *Abudefduf* principally in the adnate suborbital which is coalesced with the cheek; the mouth is lower and the lips are thicker. Only a single species is known.

513. **Nexilarius concolor** (Gill).

Euschistodus concolor Gill, Proc. Ac. Nat. Sci. Phila., 1862, 145 (Panama).

Nexilarius concolor Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 512; Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1559; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 143 (Panama Bay).

Head 3.2 to 3.6; depth 1.7 to 1.8; D. XIII, 12 or 13; A. II, 10 or 11; scales 26 to 28.

Body deep, compressed; anterior profile rather steep, strongly convex; head short; snout blunt, its length 2.6 to 3 in head; eye 2.95 to 3.6; mouth small, slightly inferior; the lips thick; the maxillary reaching to or slightly past anterior margin of eye; teeth broad, deeply notched, bifid; preopercle without definite serræ; suborbital adnate to the cheek; gill-rakers moderate, about 10 more or less developed on lower limb of first arch; lateral line arched, ending under soft dorsal; scales larger, ctenoid, snout partly naked; ventral fins scaly at base; dorsal fin long, continuous, the spines rather short, not graduated, the longest equal to length of snout and half the eye, the soft part somewhat elevated, but not strongly angulate; caudal fin moderately forked, the lobes angulate at outer rays, the upper one the longer; anal fin with 2 strong spines, the soft portion similar to that of dorsal; ventral fins rather long, the outer ray somewhat produced, reaching to or past vent; pectoral fins broad, equal to or slightly shorter than head.

Color in spirits nearly uniform dark brown; margin of scales darker; some of the specimens with very indistinct dark cross-bars; fins mostly very dark; the outer ray of ventrals pale; pectoral with a black blotch at base of upper rays, a pale area across base of fin, then dark, the margin pale.

This species is common among rocks and in tide pools. We preserved 20 specimens, ranging from 95 to 175 mm. in length.

Known from the Pacific coasts of Panama and Costa Rica, and the Galapagos Islands. Our specimens were taken at Taboga Island and Balboa.

186. Genus **Microspathodon** Günther.

Microspathodon Günther, Cat. Fish. Brit. Mus., IV, 1862, 35 (type *Glyphisodon chrysurus* Cuvier & Valenciennes).

Pomataprion Gill, Proc. Ac. Nat. Sci. Phila., 1863, 216 (type *Hypsypops dorsalis* Gill).

Body deep, compressed; head deep, broad; mouth low; teeth in upper jaw in a single series, small, close set, compressed, with entire margins, all movable, those of lower jaw larger anteriorly, reduced at sides (not entirely wanting at sides in the species at hand, as described by most authors); suborbital very broad, its lower margin free, with a deep notch between nostril and maxillary; scales larger on trunk, reduced on upper parts of head; snout scaled almost to the lips; soft dorsal and anal fins with median rays more or less elevated; caudal fin forked. Two species are known from Panama; one from each coast.

KEY TO THE SPECIES.

a. Dorsal fin with 16 or 17 soft rays; snout rather long, 1.8 to 2.15 in head; median rays of soft dorsal and anal, and the caudal lobes notably produced, falcate. *dorsalis*, p. 705.

aa. Dorsal fin with 14 or 15 soft rays; snout rather short, 2.3 to 2.5 in head; median rays of soft dorsal and anal, and caudal lobes not produced and not falcate. *chrysurus*, p. 706.

514. **Microspathodon dorsalis** (Gill).

Hypsypops dorsalis Gill, Proc. Ac. Nat. Sci. Phila., 1862, 147 (Cape San Lucas).

Pomacentrus quadrigutta Gill, Proc. Ac. Nat. Sci. Phila., 1862, 149 (Cape San Lucas; young).

Pomataprion dorsalis Gill, Proc. Ac. Nat. Sci. Phila., 1863, 216.

Microspathodon cinereus Gilbert, Proc. U. S. Nat. Mus., 1890, 71 (Clarion and Socorro islands).

Microspathodon azurissimus Jordan & Starks, in Jordan, Proc. Cal. Ac. Sci., 2nd Ser., V, 1895, 478, Pl. XLIV (Venados Islands, near Mazatlan).

Microspathodon dorsalis azurissimus Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 411.

Microspathodon dorsalis cinereus Jordan & Evermann, Rept. U. S. Fish Comm., XXI, 1895 (1896), 411.

Microspathodon dorsalis Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1568, Pl. CCXXXVI, fig. 594; Gilbert & Starks, Memoir. Cal. Ac. Sci., IV, 1904, 143 (Acapulco and Panama Bay).

Head 2.8 to 3.1; depth 1.65 to 1.75; D. XII, 16 or 17; A. II, 13 or 14; scales 27 or 28.

Body very deep, strongly compressed; anterior profile steep, nearly straight in front of eyes in adult, convex in young; head short; snout not greatly in advance of forehead, its length 1.8 to 2.15 in head; eye 3.3 to 5.4; mouth small, rather low, horizontal, the jaws of about equal length; teeth in the upper jaw small, close set, flattened, movable, present on entire outer edge of jaw, those on lower jaw larger and stronger, present on entire margin of the jaw, reduced at sides; preopercle entire; suborbital very broad, its lower margin free and entire; gill-rakers short, about 14 more or less developed on lower limb of first arch; lateral line strongly arched, ending under soft dorsal; scales ctenoid, large on trunk, reduced on upper parts of head, present on snout; vertical fins densely scaled; dorsal fin long, continuous, the spines short, graduated, the soft part falcate, a few of the rays notably produced in adult; caudal fin deeply forked, both lobes with the outer rays produced, the upper one the longer; anal fin with two strong spines, the soft portion similar to that of the dorsal; ventral fins rather long, pointed, reaching nearly or quite to origin of anal; pectoral fins broad, 1.05 to 1.3 in head.

Color said to be variable; specimens at hand bluish black above, somewhat paler below; fins very dark, the pectorals, soft dorsal and anal, and the caudal with pale margins.

This species was not taken by us, although reported as common at Panama by Gilbert & Starks. The above description is based on specimens in the National Museum, ranging from 120 to 300 mm. in length, taken at Acapulco, Panama, and the Galapagos Islands.

Known from Cape San Lucas to the Galapagos Islands.

515. Microspathodon chrysurus (Cuvier & Valenciennes).

Glyphisodon chrysurus Cuvier & Valenciennes, Hist. Nat. Poiss., V, 1830, 476 (St. Thomas).

Pomacentrus denegatus Poey, Memorias, II, 1860, 190 (Cuba).

Microspathodon chrysurus Jordan & Evermann, Bull. U. S. Nat. Mus., XLVII, 1898, 1567, Pl. CCXXXV, fig. 593.

Head 2.85 to 3.15; depth 1.75 to 1.85; D. XII, 14 or 15; A. II, 12 or 13; scales 27 or 28.

Body rather deep, compressed; anterior profile elevated, rather strongly convex; head short; snout moderate, its length 2.3 to 2.5 in head; eye 3.6 to 4.35; mouth small, terminal, slightly oblique; teeth in the upper jaw small, close set, flattened, movable, curved inward, those on lower jaw anteriorly larger and stronger, reduced at sides; preopercle entire; suborbital broad, its lower margin free, entire; gill-rakers very short, 13 to 16 more or less developed on lower limb of first arch; lateral line gently arched, ending under soft dorsal; scales finely ctenoid, larger on trunk, reduced on upper parts of the head, present on snout; vertical fins densely scaled; dorsal fin long, continuous, the spines rather short, graduated, the soft portion not falcate and not strongly angulate; caudal fin moderately forked, the lobes round, the upper one the longer; anal fin with 2 strong spines, the soft portion similar to that of the dorsal; ventral fins moderate, scarcely reaching vent; pectoral fins broad, 1.1 to 1.23 in head.

Color uniform brown. In two specimens the caudal fin is pale (orange in life), and in the other specimens at hand it is colored like the body. The other fins are bluish black.

Only 3 specimens, respectively 140, 140 and 150 mm. in length, were secured. The difference in the color of the caudal fin does not appear to be of specific importance, as we are unable to find any structural difference among our specimens.

Previously known only from the West Indies. Our specimens were taken at Toro Point and Porto Bello.

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